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TECHNOLOGY, TECHNOLOGICAL CHANGE AND MANPOWER

- A BIBLIOGRAPHY -

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Introduction

This bibliography has been developed as a byproduct of ongoing research on employment and industrial structure in Canada. This origin is reflected in the scope and coverage of the subject matter.

Technology has many dimensions and consequently definitions are bound to emphasize one set of dimensions more than another. The definition by Simon Kuznets (Social, economic and technological change; International Science Council, 1958) has been useful for the purpose of this collection. It defines technology as 'alterations in the method of producing economic goods arising out of the application of new knowledge,' and thereby focusses on inventions and innovations in products and processes, on the use of different materials and equipment and the proportion in which they are used, as well as on changes in management, organization and labour skills.

The classification outline indicates that strong emphasis has been placed on two specific dimensions of technology i.e. its role in and impact on economic analysis and Canadian policy, and its impact on labour requirements. Despite this selectiveness this bibliography does not pretend to be complete or even representative in this respect. Limitations of time and expertise in specific areas have restricted coverage and annotation.

Given these limitations the author has done an excellent job in bringing together a large variety of useful sources. I am confident that the result, together with the various other bibliographies in section four, will support and encourage continued research in the manpower implications of technological change.

A.H. Portigal, Director
Research and Planning Branch
B.C. Ministry of Labour

Classification Outline

1. Technology

    1.1 History of technology
    1.2 Impact of technological change

2. The Economics of Technology and Technological Change

    2.1 General works
    2.2 Theories of economic growth and development

        2.2.1 Growth theories
        2.2.2 Development theories

    2.3 Technology and market structure

        2.3.1 General
        2.3.2 International aspects

    2.4 The Innovative Process

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        2.4.2 Industry studies

    2.5 Canadian studies

        2.5.1 The Canadian economic and industrial climate

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            2.5.1.2 Foreign investment
            2.5.1.3 International Trade

        2.5.2 Technological innovation in Canada

3. Technology and Manpower

    3.1 General studies
    3.2 Structural changes in the labour force
    3.3 Changes in job content, skill, and educational requirements
    3.4 International aspects
    3.5 Studies of specific industries or occupations

4. Bibliographies

1. TECHNOLOGY

1.1 History of Technology

Buchanan, Ferguson, Rider, and issues of Technology and Culture provide bibliographies of the history of technology. There are also detailed bibliographies in Finch, Forbes, Hindle, Kranzberg, Landes, Singer, Usher. For the history of specific branches of technology see, especially, Ferguson, issues of Technology & Culture, Singer.

BORTH, CHRISTY Masters of Mass Production. Indianapolis, New York: Bobbs-Merrill, 1945. Pp. 290. Index.

Introduction of assembly line production; automotive industry.

BUCHANAN, R.A. "Bibliographic review . . . The history of technology" The Technologist (London). 2,2 (Spring 1965): 199-207.

Short literature review, predominantly British.

BURLINGAME, ROGER March of the Iron Men. New York: Scribner, 1938. Engines of Democracy. New York: Scribner, 1940.

Social history of American invention, first to c. 1865, next from that date on. Extensive bibliography and index in each.

DAUMAS, M. ed. A History of Technology and Invention: Progress Through the Ages. 4 Vols. (2 vols. published) Trans. Eileen B. Hennessy. New York: Crown, 1969 -

v.1. Antiquity and Middle Ages
2. Renaissance to the early 18th century
3. 18th century and the industrial revolution to the mid 19th century
4. (in preparation) - present.

Earlier events described quite generally, later events by industry or technological group.

DERRY T.K. & TREVOR I WILLIAMS A Short History of Technology from Earliest Times to AD 1900. New York: Oxford University Press, 1960 Pp. 782. Indexes. Biblio.

Based on the 5 vol. History of Technology by Singer et. al. Chapters dealing with single branches of technology; chronological divisions: only before and after 1750.

DIEBOLD, JOHN Automation: The Advent of the Automatic Factory. Princeton N.T.: Van Nostrand, 1952.

General analysis of industrial automation, organizational aspects of the new technology.

FERGUSON, EUGENE S. Bibliography on the History of Technology. Cambridge, Mass. and London: The Society for the History of Technology and the M.I.T. Press, 1968. (Society for the History of Technology, Monograph 5). Pp. xx + 347. Index.

Bibliography of general works, sources, biographies, government publications, manuscripts, periodicals, etc., and extensive listing (pp. 213-306) of monographs, articles and bibliographies on the history of technology in specific subject fields (food production, civil engineering, transportation, energy conversion, etc.) Annotated.

FINCH, JAMES K.P. Engineering and Western Civilization New York: McGraw-Hill, 1951. Pp. 397. Illustrated. Biblio. pp. 331-374

FORBES, ROBERT J. Man the Maker: A History of Technology and Engineering. London and New York: Abelard-Schuman, 1950. 365 pp. Illustrated. Index. Biblio.

Good short survey of the history of technology from the stone age to the twentieth century.

GIEDON, SIEGFRIED Mechanization Takes Command. A Contribution to Anonymous History. New York: Oxford University Press, 1948. Pp. xiv + 743. Illustrated.

U.S., England and France, 19th century and later. Discussion of the development of industrial assembly lines and the effects of mechanization on our way of life.

HABAKKUK, H.J. Industrial Organization Since the Industrial Revolution. 15th Fawley Foundation Lecture, University of Southampton, 1968. Pp. 24.

HABER, SAMUEL Efficiency & Uplift: Scientific Management in the Progressive Era 1890-1920. Chicago: University of Chicago Press, 1964. Pp. xiii + 181. Index. Biblio.

A study of Taylor and scientific management.

HINDLE, BROOKE Technology in Early America: Needs and Opportunities for Study. Chapell Hill: North Carolina University Press, 1966. Pp. xix + 145. Interpretive essay; Bibliography pp. 29-94; American technology to c. 1850.

JACOBSEN, HOWARD BOONE & JOSEPH S. ROUCEK, eds. Automation & Society. New York: Greenwood Press, 1959. Pp. 553.

32 papers on automation in various industries, and the social and economic impact of automation; pp. 486-553 contain "37 short case histories of automation in the U.S. and Canada."

KRANZBERG, MELVIN & CARROLL W. PURSELL JR., eds. Technology in Western Civilization. New York: Oxford University Press, 1967. 2 Vols, Pp. 802, 772. Illustrated.

Vol. 1. The emergence of modern industrial society, from earliest times to 1900. Vol. 2. Technology in the 20th century. Vol. 2 is concerned with rationalization, the use of resources, the development and effects of new technologies.

LANDES, DAVID The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present. Cambridge, Cambridge University Press, 1969. Index. Biblio.

Technological changes considered in historical and economic context; historical forces promoting and facilitating technological change and effects of technological change. The book is an extension of the essay, "Technological change and industrial development in Western Europe, 1750-1914," pp. 274-601 of E.J. Habakkuk + M. Postan,eds., The Cambridge Economic History of Europe, v. 6, Cambridge, 1965.

LILLEY, SAMUEL "Technological progress and the industrial revolution 1700-1914," Pp. 187-254 in Carlo M. Cipolla, ed., The Fontana Economic History of Europe, v. 3. London: Fontana, 1973.

Technology before the Industrial Revolution - Technological change in the early industrial revolution - Some thoughts about causal origins - Science in the early industrial revolution - Science and technology in the later industrial revolution - Bibliography.

MUSSON, A.E. & ERIC ROBINSON Science and Technology in the Industrial Revolution. Manchester: University of Manchester Press, 1969. Pp. viii + 534, indexes.

OLIVER, JOHN W. History of American Technology. New York: The Ronald Press Company, 1956. Pp. viii + 676. Index. Bibliographic chapter notes.

POLLARD, SIDNEY The Genesis of Modern Management. A Study of the Industrial Revolution in Great Britian. London: Edward Arnold, 1965. Pp. 328. Index.

Contents: Entrepreneurship and management: the limits of the inquiry - Large scale enterprise on the eve of the Industrial Revolution - The course of structural change in industry - The managers - The adaptation of the labour force - Accounting and management - Conclusion: management in theory and practise.

RIDER, K.J. History of Science and Technology. A Select Bibliography for Students. 2nd edition. London: The Library Association, 1970. Pp. 75. 353 entries. Index. Annotated.

Science and technology are treated separately; half of the bibliography is devoted to each. Included are bibliographies, periodicals, general histories, histories by period and subject.

SINGER, CHARLES, E.J. HOLMYARD, A.R. HALL, T.I. WILLIAMS, eds. A History of Technology. New York, London: Oxford University Press, 1954-58. 5 Vols. (corrected reprints, vols. 2, 3, 4, 1957-65).

Vol. 1. From early times to the fall of the ancient empires. Vol. 2. The mediterranean civilizations and the Middle Ages, c. 700 B.C. - 1500 A.D. Vol. 3. From the Renaissance to the industrial revolution, c. 1500 - c. 1700. Vol. 4. The industrial revolution, c. 1750 - c. 1850. Vol. 5. The late 19th century, c. 1850 - c. 1900. Cf. reviews in Technology and Culture 1,4 (Fall 1960 - entire issue).

TECHNOLOGY AND CULTURE "Current bibliography in the history of technology," 1962, Winter 1964, Spring 1965, 1966, April issues 1967-77.

Detailed classifications: 6 chronological divisions, and within each, classification into such groups as general works, sources, economic and social history, and into various branches of technology (materials and processes, industrial organization etc.) Some annotations; books and articles.

USHER, ABBOTT PAYSON A History of Mechanical Inventions. 2nd edition. Cambridge Mass: Harvard University Press, 1954, Beacon paperback 1959. Pp. xi + 450. Biblio.

Includes 4 chapters on the place of technology in economic history, the nature and process of innovation.

1.2 Impact of Technological Change

BELL, DANIEL The Coming of Post-Industrial Society; A Venture in Social Forecasting. New York: Basic Books, 1973.

BLAUNER, ROBERT Alienation and Freedom: The Factory Worker and His Industry. Chicago, 1964.

A discussion of the influence of mass production techniques on workers.

DRUCKER, PETER F. The Age of Discontinuity. Guidelines to Our Changing Society. New York: Harper & Row, 1968.

Part 1. The knowledge technologies. Ch. 2. The new industries and their dynamics.
2. From international to world economy.
3. A society of organizations.
4. The knowledge society.

FLEDDERUS, MARY L. & MARY VAN KLEECK Technology and Livelihood: An Inquiry into the Changing Technological Basis for Production as Affecting Employment and Living Standards. New York: Russell Sage Foundation, 1944.

FRIEDMAN, GEORGES Industrial Society. The Emergence of the Human Problems of Automation. Glencoe Ill., The Free Press, 1955. Pp. 436. Index. Chapter biblios.

Historical consideration of the effects of technological change on the existing structure of skills and occupations, and the organization of work.

GALBRAITH, J.K. The New Industrial State. Harmondsworth: Penguin, 1967.

HOSELITZ, BERT F. & WILBERT E. MOORE, eds. Industrialization and Society. Proceeding of the Chicago Conference on Social Implications of Industrialization and Technical Change, 15-22 Sept. 1960. Unesco-Mouton, 1963. Pp. 437.

Papers include B.F. Hoselitz, "Main concepts in the analysis of the implications of technical change;"

W.T. Easterbrook; "The entrepreneurial function in relation to technological and economic change;" S. Kuznets, "Consumption, Industrialization and Urbanization;" N. Keyfitz, "The impact of technological change on demographic patterns;" W.J. Goode, "Industrialization and family change."

KRANZBERG, MELVIN & JOSEPH GIES By The Sweat of Thy Brow: Work in the Western World. New York: G.P. Putnam's Pp. 248. Index.

A survey of the interrelations between technology and work from the Stone Age to the modern era. Cf. Review J.R. Harris in Technology and Culture 17 (Jan. 1976): 170-172.

MARCUSE, H. One Dimensional Man. Boston: Beacon, 1964.

MESTHENE, EMMANUEL G. Symposium: the Role of Technology in Society. No. 8 of the Harvard Program on Technology and Society reprints, Cambridge, Mass. 1969.

Technological Change: Its Impact on Man and Society. Cambridge, Mass.: Harvard University Press, 1970. Annotated bibliography, pp. 96-124.

MUMFORD, LEWIS Technics and Civilization. New York: Harcourt-Brace, 1934. Harbinger paperback, 1963. Pp. 495. Illustrated. Annotated biblio, pp. 447-474.

Cultural aspects of technological change since medieval times.

MUMFORD, LEWIS The Myth of the Machine: Technics and Human Development. New York: Harcourt Brace, 1967. Pp. 342. Illustrated. Annotated biblio, pp. 297-323.

PINCHBECK, IVY Women Workers and the Industrial Revolution. 1750-1850. London: Frank Cass and Co. Ltd., 1969. Pp. x + 342. Biblio. Index.

The impact of changes in social organization between 1750 - 1850 on the role and position of women.

SCHON, D.A. Technology and Change. New York: Delacorte Press, 1967. Pp. xix + 248.

2. THE ECONOMICS OF TECHNOLOGY AND TECHNOLOGICAL CHANGE

2.1 General Works

ALLEN, JAMES ALBERT Scientific Innovation and Industrial Prosperity. Amsterdam: Elsevier, 1967. Pp. 143. Indexes.

Contents: The idea of progress - The components of innovation - The components of prosperity - Research and development - The management of innovation - The role of government in innovation.

AMES, E. & N. ROSENBERG. "Changing technological leadership and economic growth," Economic Journal 73,289 (Mar. 1963).

CALDWELL, LYNTON, ed. Science, Technology and Public Policy. A Selected and Annotated Bibliography. 2 Vols. Prepared for the National Science Foundation by the Program in Public Policy for Science and Technology, Department of Government, Indiana University, Bloomington, Indiana. Revised edition, 1969.

Materials published 1945-1967; Vol. 1 - books, monographs, government documents, and whole issues of journals; vol. 2 - articles in journals. Categories include the philosophy of science and technology, the history of science and technology, nature and impact of science and technology, science and government, legal aspects, scientific and technical personnel, organization and management of R. & D. Author and title index.

DAVID, PAUL A. Technical Choice Innovation and Economic Growth: Essays on American and British Experience in the Nineteenth Century. London: Cambridge University Press, 1975.

See J.G. Williamson, "Technology, growth and history," Journal of Political Economy 84,4 pt. 1 (August 1976): 809-821; also reviews by W. Paul Strassman in Technology and Culture 17 (April 1976): 380-82 and G.N. von Tunzelmann in Journal of Economic History 35 (December 1975): 852-55.

DEGREGORI, THOMAS R. Technology and Economic Change: Essays and Inquiries. Comox, B.C.: McLaughlin Associates, 1974. (Notes and papers in development 9) Pp. 75. Index.

FELLNER, W. "Trends in the activities generating technological progress," American Economic Review (March 1970).

GOLDSMITH, MAURICE, ed. Technological Innovation and the Economy. Wiley-Interscience, London, 1970. (Science of science foundation symposium on technological innovation and the growth of the economy, Churchill College, 1969). Pp. xvii + 292. Index.

GOULD, JOHN DENNIS Economic Growth in History: Survey and Analysis. London, Methuen 1972. Pp. xx + 460. Index. Biblio.

GRILICHES, Z. "Hybrid corn: an exploration of the economics of technological change". Econometrica 25 (October 1957): 501.

HABAKKUK, H.J. American and British Technology in the Nineteenth Century. The Search for Labour Saving Inventions. Cambridge: Cambridge University Press, 1967. Pp. 222. Index.

HARDIN, EINAR, WILLIAM B. EDDY, & STEPHEN E. DEUTCH Economic and Social Implications of Automation. An Annotated Bibliography. School of Labour and Industrial Relations, Michigan State University, East Lansing, Michigan, 1961.

HEERTJE, ARNOLD Economics and Technical Change. London: Weidenfeld and Nicolson, 1973. Pp. xii + 334. Indexes.

Contents: Introduction - the classical economists - Marx - Technical development up to 1900 - The beginnings of production theory - Schumpeter - Technical development since 1900 - Microeconomic production theory - Macroeconomic production theory - Technical change and economic growth - Technical change and monopoly power - Technical development and economic policy - The shifting frontiers.

HUGH-JONES, E.M., ed. Economics and Technical Change. Papers presented to section F (economics) and jointly to sections F and G (engineering) at the 1968 annual meeting of the British Association for the Advancement of Science. New York: A.M. Kelley, 1969. Pp. 179. Index.

JEWKES, JOHN, DAVID SUMMERS & RICHARD STILLMAN The Sources of Invention. New York: Norton (1959) 1969. Pp. 372. Illustrated. Biblio.

Incremental vs. major innovations, economic impact, policy implications.

JOHNSTON, R.E. "Technical progress and innovation," Oxford Economic Papers 18,2 (July 1966): 158-176.

Examination of existing theories on technical progress (Kaldor, Arrow, Domar, etc.) and on innovation (Schumpeter, Galbraith, Bain, Freeman, etc.), a collection of evidence which supports or refutes these theories.

LAVE, LESTER B. Technological Change: Its Conception and Measurement. Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966. Pp. 228. Index. Biblio.

LEONARD, WILLIAM N. "Research & development in industrial growth" Journal of Political Economy 79,2 (March-April 1971):

MANSFIELD, EDWIN The Economics of Technological Change. New York: W.W. Norton, 1968. Pp. x + 257.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY. CENTER FOR POLICY ALTERNATIVES.
An Annotated Bibliography with Index for Technology Policy Studies. 2nd edition. M.I.T., May 1975. Pp. 418.

Prepared with the use of computer systems. Organized by "keywords"; author and title indexes.

MENCHER, PLAN Bibliography for the Study of U.K. Science and Technology Policy with Special Reference to Economic and Industrial Development. Part 1, 1959-1973. M.I.T. Centre for Policy Alternatives and London Graduate School of Business Studies. M.I.T. Bibliography no. 1091, 1973. Pp. 92.

NATIONAL BUREAU OF ECONOMIC RESEARCH
The Rate and Direction of Inventive Activity: Economic and Social Factors. Princeton N.J.: Princeton University Press, 1962. Pp. 635. Index.

A collection of 23 papers plus an introduction by R.R. Nelson and comments on the papers, arranged in 6 sections: Problems of definition and measurement, theory and macro-quantitative analysis, case studies, non-market factors, efficiency in research and development, welfare economics and inventive activity. Contributors include S. Kuznets, B.S. Sanders, J.R. Minasiau, J. Schmookler, W. Fellner, J.S. Worby, W.R. Thompson, Y. Brozen, M.J. Peck, J.C. Enos, W.F. Mueller, A.H. Rubenstein, J.W. Markham, K.J. Arrow.

NELSON, R.R. "The economics of invention: a survey of the literature," Journal of Business 32,2 (April 1959): 101-27.

NELSON, RICHARD R., MARTIN J. PECK & EDWARD D. KALACHEK Technology, Economic Growth and Public Policy. Washington: Brookings Institution, 1967.

NORDHAUS, WILLIAM D. Invention, Growth and Welfare. A Theoretical Treatment of Technological Change. Cambridge, Mass.: M.I.T. Press, 1969. Pp. xiv + 168. Index. Biblio.

RANIS, G. Technology Choice, Employment and Growth. Yale Economic Growth Centre, Discussion Paper No. 97. 1970.

ROSENBERG, NATHAN Perspectives on Technology. Cambridge: Cambridge University Press, 1976. Pp. x + 353. Index, Chapter biblios.

Collection of 15 articles originally published between 1963 and 1974. Organized in 4 parts: I Some origins of American technology; II The generation of new technologies; III Diffusion of adaptation of technology; IV Natural resources, environment and the growth of knowledge.
See review by H.F. Williamson, Journal of Economic Literature 15,4 (December 1977): 1377-78.

ROSENBERG, NATHAN Technology and American Economic Growth. New York: Harper and Row, 1972. Pp. vi + 211. Index.

SALTER, W.E.G. Productivity and Technical Change. London: Cambridge University Press, 1960.

SAUL, SAMUEL BERRICK, ed. Technological Change: The United States and Britain in the Nineteenth Century. London: Methuen, 1970. Pp. 198. Biblio.

SCHMOOKLER, JACOB Invention and Economic Growth. Cambridge Mass: Harvard University Press, 1966. Pp. xv + 332. Index.

UNESCO The Role of Science and Technology in Economic Development. Paris, Unesco, 1970. Pp. 216.

Conclusions on the three topics addressed by the meeting: Science policy and economic development, methods of integrating scientific and economic planning into over-all planning, problems and methods of financing scientific

and technological research; the texts of studies presented to the meeting, including Matthews, R.C.O. "Contribution of science and technology to economic development," pp. 29-44; Szakasits, G.D. "Various approaches to the problem of the integration of scientific and economic plans into general planning," pp. 67-82; Quinn, J.B. "Scientific and technical strategy of the national and major enterprise level," pp. 83-102; Komzin, B. "The economic impact of scientific and technological progress," pp. 103-120.

UNITED STATES. NATIONAL SCIENCE FOUNDATION. OFFICE OF SPECIAL STUDIES.
A Selected Bibliography of Research and Development and its Impact on the Economy. Washington, 1958.

Bibliography on the Economic and Social Implications of Scientific Research and Development. Washington, 1959.

WILLIAMS, BRUCE RODDA Technology, Investment and Growth. London: Chapman and Hall, 1967. Pp. 206.

WILLIAMS, BRUCE RODDA, ed. Science and Technology in Economic Growth. New York and Toronto: Halsted Press for the International Economic Association; London: MacMillan, 1973. Pp. xviii + 446. Illustrated.

2.2 Theories of Economic Growth and Development

2.2.1 Growth Theories

Theories of economic growth are various, highly debated, and technical. Surveys by Abramovitz, Hahn and Matthews, Britto, Jones, Kennedy and Thirlwall, and Nadiri provide a guide through the maze and present the topics of debate; anthologies edited by Hahn, Sen, and Stiglitz and Uzawa reprint key articles.

ABRAMOVITZ, M. "Economics of Growth." Pp. 132-182 in B.F. Haley, ed., A Survey of Contemporary Economics, Vol II. Homewood, Ill.: Irwin, for the American Economic Association, 1952.

BRITTO, RONALD "Some recent developments in the theory of economic growth: an interpretation," Journal of Economic Literature 11,4 (December 1973): 1343-1366.

A survey of developments in growth theory from the time of publication of Hahn and Matthews' survey to 1973. Section III is concerned with the role of technical progress.

HAHN, F.H. & R.C. MATTHEWS "The theory of economic growth: a survey," originally published in the Economic Journal, reprinted in Surveys of Economic Theory, Vol. II, (Prepared for the American Economic Association and Economic Society.) pp. 1-124. New York: St. Martin's Press, 1965.

A survey of economic growth, arranged in three parts: Section I deals with "those parts of the theory of growth that can be dealt with in abstraction from technical progress. Section II deals with technical progress and includes treatment of the problems raised by 'non-malleability' of capital. Section III, on linear models, deals with the formal development of the type of treatment of growth that stems from the work of Neumann, Mrs. Robinson and Morishima on the one hand, and Leontief, on the other." Bibliography, pp. 113-124.

HAHN, F.H. Readings in the Theory of Growth. A selection of papers from the Review of Economic Studies. MacMillan: St. Martin's Press, 1971. Pp. xv + 275.

HOSELITZ, B.D., J.J. SPENGLER, J.M. LETICHE, E. McKINLEY, J. BUTTRICK, H.J. BRUTON.
Theories of Economic Growth. Glencoe, Ill.: The Free Press. Pp. 344. Index.

Includes: E. McKinley, "The theory of economic growth in the English classical school" pp. 89-112; J. Buttrick, "Toward a theory of economic growth: the neoclassical contribution" pp. 155-92; B.F. Hoselitz, "Theories of stages in economic growth" pp. 150-174.

JONES, HYWEL G. An Introduction to Modern Theories of Economic Growth. London: Nelson, 1975. Pp. 253. Indexes. Biblio pp. 241-256.

Discussion of the development of growth theory, controversies; useful bibliography and structured reading list.

KENNEDY, C. & A.P. THIRLWALL "Technical progress." Surveys of Applied Economics, Vol. I, pp. 115-176. (Royal Economic Society and the Social Science Research Council.) London: MacMillan, 1973.

NADIRI, M. ISHAQ "Some approaches to the theory and measurement of total factor productivity: a survey," Journal of Economic Literature 8,4 (December 1970): 1137-1177.

NELSON, R.R., S.G. WINTER & H.L. SCHUETTE
"Technical Change in an evolutionary model," Quarterly Journal of Economics 90,1 (February 1976): 90-118.

SEN, AMARTYA, ed. Growth Economics: Selected Readings. Harmondsworth: Penguin, 1970. Pp. 549. (Penguin Modern Economics Readings)

STIGLITZ, JOSEPH E. & HIROFUMI UZAWA, eds.
Readings in the Modern Theory of Economic Growth. Cambridge, Mass: The M.I.T. Press, 1969. Pp. viii + 497. Indexes.

2.2.2 Development Theories

AGARWALA, A.N. & S.P. SINGH, eds.
The Economics of Underdevelopment. New York: Oxford University Press, 1963. Pp. 510. Index.

Anthology includes papers by: G.M. Meier, D. Baran, A. Knight, S. Kuznets, W.W. Rostow, H. Watich, V. Rao, H. Bruton, P. Rozenstein-Rodan, R. Nurkse, J. Fleming, T. Scitovsky, G. Furbado, R.S. Elliaus, H.W. Siager, W.A. Lewis, M. Bronfenbrenner.

BARANSON, J. Technology for Underdeveloped Areas. An Annotated Bibliography. Oxford, Toronto: Pergamon Press, 1967. Pp. 81. Indexes.

Part 1. Economic Aspects.
2. Socio-cultural Influenced on Technology.
3. Products and Systems.
4. Institutional Arrangements.

BARANSON, J. "The role of science and technology in advancing development in newly industrializing states," Socio-Economic Planning Sciences (December 1969).

BATH, C. RICHARD & DILMUS P. JAMES
"Dependency Analysis of Latin America," Latin American Research Review 11,3 (1976): 3-55.

Summary of dependency theory.

BAUER, PETER TAMAS Dissent on Development: Studies and Debates in Development Economics. London: Weidenfeld and Nicolson, 1971. Pp. 550. Index. Biblio.

Articles which were, in whole or in part, previously read or published, discussion of various issues of

development theory and policy from a neoclassical perspective; case studies (pp. 345-435) and review articles (pp. 436-530). Criticism of "radical" and dependency theories.

BOEKE, JULIUS HERMAN Economics and Economic Policies of Dual Societies, As Exemplified by Indonesia. New York: Institute of Pacific Relations, 1953. Pp. x + 324. Index.

Major study of social dualism ("the clashing of an imported social system with an indigenous social system of another style"); initiated other dualism theories. See B. Higgins "The dualistic theory of underdeveloped areas, Economic Development and Cultural Change, (January 1956): 99-115.

BREWSTER, HAVELOCK "Economic dependence: a quantitative interpretation," Social and Economic Studies 22,1 (March 1973): 90-95.

CANADA. DEPARTMENT OF REGIONAL ECONOMIC EXPANSION. Regional Development and Economic Growth. Problems, Analyses, and Policies. Select Bibliography. Planning Division, Department of Regional Economic Expansion, Ottawa, May 1969. Pp. 285.

Contents: General - Canada - France - Great Britain - Italy - Sweden - U.S. - Regional Development: theory, analyses, techniques - Regional Development: policy, planning, programmes.

CARR, MARILYN Economically Appropriate Technologies for Developing Countries: An Annotated Bibliography. London: Intermediate Technology Publications, 1976. Pp. 100. Index.

Introduction:
1. Agriculture
2. Low Cost Housing of Building Materials
3. Manufacturing
4. Infrastructure
5. Handbooks, Manuals, Buyer's Guides, Technical publications

Good biblio, listing research supporting development of intermediate technology, or appropriate technology; many industry or product specific examples from developing countries; balance between labour-intensive/capital intensive; choice of scale of production, problems of measurement re cost/benefit. Choice between technologies but also innovation/development.

CHENERY, H.B. "Comparative advantage and development policy," American Economic Review 51,1 (March 1961): 18-51.

----- "The structuralist approach to development policy," American Economic Review, Papers and proceedings 65,2 (May 1975): 310-316.

Review of the structuralist approach: methodology, internal development policy, external policy. Discusses early hypotheses (of Rosenstein-Rodan, Nurkse, W.A. Lewis, Prebisch, Singer, Myrdal), hiatus in 1960's, return to structural concerns. Two basic elements of structuralist approach: "the concept of a dual economy and the concept of complementarity in demand which underlies the theories of balanced growth."

COOPER, C.M. "Choice of techniques and technological change as problems in political economy," International Social Science Journal 25,3 (1973): 293-304.

CORNWALL, JOHN "The relevance of dual models for analyzing developed capitalist economies," Kyklos 30,1 (1977): 51-73.

"The main purposes of this paper are: (1) to develop a general model of the dual economy, one that will provide a framework for analyzing both developed and developing economies and (2) to determine the applicability of the dual model by analyzing the behavior of developed market economies in the post-war period. The main conclusion emerging from our study is that developed market economies operate in such a way that by continuing to stress their dual structure, real insights into the behavior of market capitalism are possible. Developed and developing economies have more in common than is usually assumed by the profession. This also suggested that the failure of some economies to behave according to the outline of the dual model was the lack of a strong demand for labour in the high wage sectors rather than any sort of supply constraint."

DEGREGORI, T.R. "Technology and economic dependency: an institutional assessment," Journal of Economic Issues 12,2 (June 1978): 467-476.

Impressionistic review of positions. Some specific, critical observations on small-scale or appropriate technology.

DOS SANTOS, THESTONIO "The structure of dependence," American Economic Review, Papers and proceedings, 60,4 (May 1970): 231-236.

Reprinted in Ck Wilber, ed. The Political Economy of Development and Underdevelopment. New York: Random House, 1973. Pp. 109-123. Basic outline of dependency theory.

ECONOMIC DEVELOPMENT AND CULTURAL CHANGE
"Essays in honour of Bert Hoselitz," Volume 25, supplement, 1977. This collection includes, in addition to the articles by Felix and Hirschman mentioned below:

H. Bruton, "A note on the transfer of technology"
G. Ranis, "Development theory at three quarters Century"
G. Papanek, "Economic development theory: the earnest search for a mirage"
S. Kuznets, "Notes on the study of economic growth of nations"
H. Johnson, "Changing views on trade and development: some reflections"
A. Sturmthal, "Employment and development models"

FEI, JOHN C.H. & GUSTAU RANIS Development of the Labour Surplus Economy: Theory and Policy. Homewood Ill.: Richard D. Irwin 1964. Pp. x + 324. Index.

Contents: Introduction: an approach to the problem - The landscape of development - Capital accumulation and technological change in the dualistic economy - Development of the industrial sector - Development through markets in the dualistic economy - Development of the agricultural sector - The life cycle of economic growth - Development in the open economy.

FELIX, DAVID "The technological factor in socio-economic dualism: toward an economy-of-scale paradigm for development theory," Economic Development and Cultural Change 25 (supplement, 1977): 180-211

FRANK, ANDRE GUNDER "The development of underdevelopment," Monthly Review 18,4 (September 1966): 17-31.

----- "Dependence is dead, long live dependence and the class struggle: an answer to critics," World Development 5,4 (April 1977): 355-70. Biblio. pp. 365-70. of books and articles devoted to A.G. Frank and dependency theory.

GIRVAN, NORMAN "Multinational corporations and dependent underdevelopment in mineral export economics," Social and Economic Studies 19,4 (December 1970): 490-526. "Comment" by V.A. Lewie, pp. 527-533.

GANIERE, N. Transfer of Technology and Appropriate Techniques: A Bibliography. OECD, Development Centre, Paris, 1973.

GEIGER, H. KENT National Development 1776-1966. A Selective and Annotated Guide to the Most Important Articles in English. Metuchen, N.J.: Scarecrow Press, 1969. Pp. 247. Index.

350 items on the cultural, economic, social and political aspects of development, presented in order of date of publication. There is a subject, author and title index. Careful annotations, and a somewhat involved series of evaluations, expressed in 4 different scales for each item.

GERSCHENKRON, ALEXANDER Economic Backwardness in Historical Perspective. Cambridge, Mass.: Harvard University Press, 1962.

GRIFFIN, KEITH Underdevelopment in Spanish America: An Interpretation. London: George, Allen and Unwin, 1969. Pp. 288. Index.

Pp. 19-50 discussion and criticism of dualist and stage theories.

HAGEN, EVERETT E. The Economies of Development. Homewood, Ill.: Richard D. Irwin, 1975. Pp. xx + 563. Index. Biblio.

HANSON, JAMES A. "The Leading Sector development strategy and the importance of institutional reform," Journal of Economic Studies 3,1 (May 1976): 1-12. Discussion of Hirschman and Currie. Cf. "comment" by Lauchlin Currie, 3,2 (November 1976): 164-169.

HIGGINS, BENJAMIN Economic Development. Problems, Principles and Policies. New York: W.W. Norton and Co., Inc., 1968. (revised edition) Pp. vvi + 918. Index. Selected biblio.

A standard textbook, revised in 1968, discussing general theories of growth and development, some historical background, theories of underdevelopment, and policies, and cast studies. Discussion of technological dualism.

HIRSCHMAN, ALBERT O. The Strategy of Economic Development. New Haven, Conn.: Yale University Press, 1958. Pp. xiii + 217. Indexes.

Contents: Preliminary explorations - Growth Models and Development processes - balanced growth: a critique -

unbalanced growth: an epousal - investment choices and strategies - interdependence and industrialization - Industrialization: further characteristic aspects - Efficiency and growth of the individual firm - The role of disturbances - Interregional and international transmission of economic growth - Conclusion: functions of government and foreign aid.

HIRSCHMAN, ALBERT O. "A generalized linkage approach to development, with special reference to staples." Economic Development and Cultural Change 25 (supplement, 1977): 67-98.

A review of the linkage approach, and a proposal of some extensions and generalization of it. First, a discussion of production consumption, and fiscal linkages and their interactions, and of forward linkages as handicaps. Second, the introduction of a new subdivision, inside and outside linkages, the varieties and implications of the resultant categories. Finally, further methodological consideration.

HYMER, STEPHEN "The multinational corporation and the law of uneven development," Economics and World Order. ed. J.N. Bhagwati, New York: World Law Fund, 1970.

ILLCHMAN, WARREN FREDRICK & RAVINDOG C. BHARGAVA "Balanced thought and economic growth," Economic Development and Cultural Change 24,4 (July 1966): 385-399.

An analysis of 3 theories/strategies for economic growth: "big push" balanced growth (Nurkse, Rosenstein-Rodan), unbalanced growth (Hirschman), capital formation through unlimited supplies of labour (Lewis, Nurkse). The assessment is not in terms of economic merit, but of "the major social problems that might arise from undertaking them and the political regime and administrative systems they presuppose."

JACKSON, S. Economically Appropriate Technologies for Developing Countries: A Survey. Overseas Development Council, Occasional Paper No. 3, Washington, 1972.

JEQUIER, A. Appropriate Technology: Problems and Promises.

Paris: Development Centre of the OECD, c. 1976. Pp. 344.

JENKINS, G. Non-Agricultural Choice of Technique: An Annotated Bibliography of Empirical Studies. Institute of Commonwealth Studies, Oxford, 1975.

JORGENSON, D.W. "The development of a dual economy," Economic Journal 71 (June 1961): 309-334.

"The purpose of this paper is to begin a frontal attack on the gap between theories of growth and theories of development by presenting a theory of the development of a dual economy."

JUNTA DEL ACUERDO DE CARTAGENA Technology Policy and Economic Development. International Development Research Centre, Ottawa, 1976.

KAUFMAN, R.R., DANIEL S. GILLER & HARRY I. CHERNOTSKY "Preliminary test of the theory of dependency," Comparative Politics 7,3 (April 1975): 303-330.

Statistical comparison of Latin American countries, test of a series of bivariate hypothesis arising from dependency theory. While stressing the "preliminary" nature of the test, the authors suggest that the results challenge several aspects of the theory.

KELLEY, A.C., J.G. WILLIAMSON & R.J. CHEETHAM Dualistic Economic Development. Theory and History. Chicago: University of Chicago Press, 1972. Pp. xi + 399.

Elaboration of dual economy and surplus labour concepts within a 2-sector neoclassical system. Determining shadow price for labour, which is then used in project evaluation and in establishing need for labour subsidies. Cf. review by Hugh Patrick, Journal of Asian Studies, 33,2 (February 1974): 319-321.

KINDLEBERGER, CHARLES P. & BRUCE HERRICK Economic Development. Toronto: McGraw-Hill Book Co., 1977. 3rd edition.

KUZNETS, S. Economic Growth Rate, Structure and Spread. New Haven: Yale University Press, 1966.

Towards a Theory of Economic Growth. New York: W.W. Norton, 1968.

LEIBENSTEIN, H. "Technical progress, the production function and dualism," Banco Nazionale del Lavoro Quarterly Review. (December 1960): 345-60.

"The purpose of this paper is to suggest a view of the production function and its relation to technical progress which may lead to insights into our understanding of the phenomenon of economic dualism."

LEWIS, WILLIAM ARTHUR "Economic development with unlimited supplies of labour," Manchester School of Economic and Social Studies, 22 (May 1954): 139-191.

"Unlimited labour: further notes," Manchester School of Economic and Social Studies 26 (June 1958): 1-32.

MCKINNON, RONALD I. Money and Capital in Economic Development. Washington: Brookings Institution, 1973. Pp. xii + 184. Index.

McKinnon's "analysis leads to a critique of existing monetary theory and to a new view of the relation between money and capital in developing countries. He finds that the impact of monetary and financial policies on their capital markets is much greater than is generally supposed, and that their governments often follow policies that stifle incentives to save and invest. Repression of the financial sector is paralleled by the use of tariffs and quotas in an effort to promote development by manipulating the foreign trade sector. McKinnon advances theoretical arguments and empirical evidence to suggest that a more effective strategy for economic growth would proceed from a thorough liberalization of financial markets and the lifting of restraints on foreign trade." Review article by N. Stern, Journal of Development Economics 1 (1974): 191-211; review by L. Tayler Journal of Development Economics 1 (1974): 81-84.

MEIER, GERALD M. & ROBERT E. BALDWIN Economic Development: Theory, History, Policy. New York: John Wiley and Sons, 1957. Pp. 588. Index. Biblio.

MEIER, GERALD MARVIN, ed. Leading issues in Development Economics. Selected Materials and Commentary. New York: Oxford University Press, 1964. Pp. Xiii + 572.

"The following issues are explicated in successive chapters: (1) the validity of Rostow's analysis of the stages of growth (2) the meaning and significance of dualism (3) problems of capital accumulation (4) effects of inflation on development (5) criteria for allocating investment resources (6) the relative emphasis to be given industrialization and agriculture in the development process (7) the influence of international trade on development (8) the scope for development planning and (9) techniques of development planning." With commentary bibliographical notes for each chapter.

MULLER, RONALD "The multinational corporation and the underdevelopment of the third world," Pp. 124-151 in C.K. Wilber, ed., The Political Economy of Development and Underdevelopment. New York: Random House, 1973.

ONOH, J.K. Strategic Approaches to Crucial Policies in Economic Development: A Macro-Link Study in Capital Formation, Technology and Money. Rotterdam: Rotterdam University Press, 1972. Pp. xiii + 236. Index. Biblio.

PORTER, R.C. "Technological change with unlimited supplies of labour," Manchester School of Economic and Social Studies 36,1 (1968): 69-74.

NELSON, R.R. "A theory of the low level equilibrium trap . ." American Economic Review 46 (December 1956): 894-908.

NURKSE, RAGNAR Problems of Capital Formation in Underdeveloped Countries. New York: Basil Blackwell, (1953) 1960. Pp. 163. Index.

One of main sources of the following problems in development theory: "vicious circle of poverty," "big push" balanced growth, development through unlimited supplies of labour (dualism).

O'BRIEN, PHILIP J. "A critique of Latin American theories of dependency," Pp. 7-27 in Ivar Oxaal, Tony Barnett and David Booth, eds., Beyond the Sociology of Development. London: Routledge and Kegan Paul, 1975.

ROSENBERG, N. "Economic development and the transfer of technology: some historical perspectives," Technology and Culture (October 1970): 550-575.

ROSENSTEIN-RODAN, P.N. "Problems of industrialization of eastern and south-eastern Europe." Pp. 245-255 in A.N. Agarwala and S.P. Singh, The Economics of Underdevelopment, New York: Oxford University Press, (1958) 1963.

"Notes on the theory of the 'big push'." Economic Development for Latin America. Proceedings of a conference held by the International Economic Association, 1961. See comments by C. Furtado and R. Nurkse, pp. 57-81.

ROSTOW, WALT WHITMAN "The take-off into self-sustained growth" Economic Journal (1956) and Pp. 154-186 in A. Agarwala and S.P. Singh, eds. The Economics of Underdevelopment. New York: Oxford University Press, 1963.

The Stages of Economic Growth. New York: Cambridge University Press, 1960, 2nd edition, 1971.

See P.A. Baran and E.J. Hobsbawn, "The stages of economic growth: a review," Kyklos 24,2 (1961): 234-242, reprinted in Wilber, pp. 45-54; and G.M. Meir, Leading Issues in Development Economics (New York: Oxford University Press, 1964), pp. 23-48, in which appear discussions by Meier, S. Kuznets, A. Cairncross, H. Habakkuk and Gershenkron.

SEN, AMARTYA K. Choice of Techniques: An Aspect of the Theory of Planned Economic Development. 2nd edition. Oxford: Basil Blackwell, 1968.

SCHUMPETER, JOSEPH The Theory of Economic Development. New York: Oxford University Press (1911, 1934) 1961.

SINGER, H.W. The Strategy of Economic Development: Essays in the Economics of Backwardness. ed. by A. Cairncross and M. Puri. London: MacMillan, 1975 xvi + 243 pp.

See review by A. Bottomley, Economic Journal 86 (September 1976).

SLOAN, JOHN W. "Dependency theory and Latin American development: another key fails to open the door," Inter-American Economic Affairs 31,3 (Winter 1977): 21-40.

Review and critique of dependency theory.

STREETEN, PAUL The Frontiers of Development Studies. London: MacMillan, 1972. Pp. xv + 498. Index.

Collection of essays, most previously published, on the problems of development. Organized in four parts: (1) development theory and policy, (2) international movements of capital, money and goods, (3) projects and technologies - project appraisal and policies in the face of conflicts between employment and output, technology transfer, (4) the Commonwealth.

SUNKEL, OSVALDO "National development policy and external dependence in Latin America," Journal of Development Studies 6,1 (October 1969): 23-48

SWANY, P.S. "Statistical evidence of balanced and unbalanced growth," Review of Economics and Statistics 49,3 (August 1967): 288-303.

Hypothesis of a relationship between overall growth rate and inbalance in sectoral growth rates. Findings: positive relationship; even though sectoral imbalances tend to decline as the overall level of development increases.

WATKINS, MELVILLE H. "A staple theory of economic growth," Canadian Journal of Economics and Political Science 29 (May 1963): 141-158.

WILBER, CHARLES K., ed. The Political Economy of Development and Underdevelopment. New York: Random House, 1973. Pp. x + 434. Select biblio. No index.

A textbook/reader which includes reprints or excerpts of articles written by several from the "radical" school of development theory: Dudley Seers, Keith Griffin, Paul Baran, E.J. Hobsbawn, A.G. Frank, T. Dos Santos, Celso Furtado, R. Muller, J.W. Gurley, I. Illich, R. Rhodes, Robinson. Readings divided into 8 groups: methodological problems, historical perspective, trade and imperialism, agricultural and industrial institutions and strategies, comparative models of development, human cost of development, implications for the future.

YOTOPOULOS, P.A. & L.J. LAU "A test for balanced and unbalanced growth," Review of Economics and Statistics. 52 (1970): 376-383.

"Our findings fail to support the unbalanced growth hypothesis. On the contrary, our indexes of imbalance, whether they referred to the von Neumann notion of uniformity, to the Nurkse variant of elasticity, or to the distinction between producer and consumer oriented industries, are inversely related to the rate of growth. A similar inverse relationship exists between the indexes of imbalance and the level of development."
Cf. L. Shashua and Y Goldschmidt "The merits of balanced growth reconsidered" same journal, 54 (August 1970): 337-339, and P.A. Yotopoulos and L.J. Lau, "The balanced - unbalanced growth controversy revisited" same journal. 57 (1975): 516-17.

YOTOPOULOS, P.A. & J.B. NUGENT "A balanced-growth version of the linkage hypothesis: a test," Quarterly Journal of Economics 87,2 (May 1973): 157-171.

See in Quarterly Journal of Economics 90,2 (May, 1976) P.S. Laumas "The weighting problem in testing the linkage hypothesis," pp. 308-312; M. Boucher, "Some further

results on the linkage hypothesis," pp. 313-318; J. Riedd, "A balanced-growth version of the linkage hypothesis, "pp. 319-322; L.P. Jones, "The measurement of Hirschmanian Linkages," pp. 323-33, and Yotopoulos and Nugent "In defense of the linkage hypothesis," pp. 334-343.

2.3 Technology and Market Structure

2.3.1 General

AARONOVITCH, S. & M.C. SAWYER Big Business. Theoretical and Empirical Aspects of Concentration and Mergers in the United Kingdom. London: MacMillan 1975. Pp. xiv + 337. Cf. review by C.K. Rowley, pp. 143-5 Economic Journal, 86 (March 1976).

Marxist analysis of post-war concentration through merger in Britain; "cost of rivalry" thesis vs. neo-classical model; empirical, econometric evidence; policy implications.

ADAMS, WILLIAM J. "Firm size and research activity: France and the United States," Quarterly Journal of Economics 84 (August 1970): 386-409.

ARROW, K.R. "Economic welfare and the allocation of resources for invention," Pp. 609-625 in National Bureau of Economic Research, The Rate And Direction of Inventive Activity: Economic and Social Factors, Princeton, N.J.: Princeton University Press, 1962.

ATKINSON, G.W. & M. REED "The public sector and stabilization of industrial society," Journal of Economic Issues 12,2 (June 1978): 373-384.

Theme: technological evolution and the dual economy.

BAIN, J.S. Industrial Organization. London: Chapman and Hall, 1968. 2nd edition. Pp. xv + 678.

CAPRON, WILLIAM M., ed. Technological Change in Regulated Industries. Papers prepared for a conference of experts. Washington, D.C.: Brookings Institution, 1971. Pp. xiii + 238. Index.

Papers developed from a Brookings Institution Conference in February 1969, held to address this question: "What effect does regulation have on the pace and pattern of technological change in such key sectors as transportation, energy production, and communications?"

Introduction by W.M. Capron, "Innovation and monopoly regulations" by F.M. Westfield," W.R. Hughs on electric power, W.G. Shepherd on communication, A. Phillips on U.S. air transport, A.J. Gellman on surface freight transport; summary and conclusions by W.M. Capron and R.G. Noll.

CARTER, C.F. & B.R. WILLIAMS Investment in Innovation. Oxford University Press, 1958. Pp. iv + 167. The role of competition.

CAVES, R.E. "Multinational firms, competition and productivity in host-country markets," Economica (1974): 176-193.

CHARLESWATER ASSOCIATES, INC. The Impact on Small Business Concerns of Government Regulations that Force Technological Change. Final Report. Prepared for Small Business Administration and Experimental Technology Incentives Program, National Bureau of Standards, Washington: U.S. Government Printing Office (1975) 1976. Pp. 336.

COMANOR, W.S. "Market structure, product differentiation and industrial research," Quarterly Journal of Economics 81 (November 1967): 639-657.

DAVIDSON, W.H. "Patterns of factor-saving innovation in the industrialized world," European Economic Review 8,3 (October 1976): 207-217.

"An attempt is made in this study to empirically measure the impact of factor endowment on innovation trends. A large international sample of significant innovations was used wherein each innovation is classified according to its perceived factor saving impact, as seen by the innovating firm, the user and industry/market observers. Then, broad trends in labour, material, and capital saving innovations were measured in eight European nations, the U.S., the U.K. and Japan. International variations in these trends were correlated with international variations in relative factor costs. A very high degree of correlation was found, supporting the position that factor endowment significantly influences innovation trends in the industrialized world."

DEMSETZ, H. "Information and efficiency: another viewpoint," Journal of Law & Economics 12,1 (April 1969): 1-22. See B.S. Yamey "Monopoly, competition and the incentive to invent," Journal of Law and Economics 13,1 (April 1970): 253-256

FELLNER, W.J. "The influence of market structure on technological progress," Quarterly Journal of Economics 65,4 (November 1951): 560-567. (Erratum, 66,2 (May 1952): 292-298).

FELLNER, W. "Does the market direct the relative factor-saving effects of technological progress?" Pp. 171-188. National Bureau of Economic Research. The Rate and Direction of Inventive Activity, Princeton, N.J.: Princeton University Press, 1962, with comments by E. Mausfield and C.J. Hitch, pp. 188-194.

FISHER, F.M. & P. TEMIN "Returns to scale in research and development: what does the Schumpeterian hypothesis imply?" Journal of Political Economy 81 (Jan - Feb 1973): 56-70.

FURUBOTN, E. "Engineering data and the production function," American Economic Review 55 (June 1965): 512-515. Cf. comment by L.B. Lave and reply by Furubotn, American Economic Review 56 (September 1966): 872-880.

GALATIN, M. Economies of Scale and Technological Change in Thermal Power Generation. Amsterdam: North-Holland, 1968. Pp. 196.

GALBRAITH, JOHN KENNETH American Capitalism. Houghton Mifflin, Boston, 1952. The New Industrial State. Penguin, Harmondsworth, 1967.

GOLD, BELA "Alternative strategies for strengthening competitive position through advance in technology," Research Management 18,4 (July 1975): 24-29.

GREER, D.F. & S.A. RHOADES "Concentration and productivity changes in the long and short run," Southern Economic Journal 43,2 (October 1976): 1031-44.

HAMBURG, D. "Size of firm, oligopoly and research: the evidence," Canadian Journal of Economics and Political Science 30,1 (1964): 62-75. Comment by Scherer 31,2 (1965): 256-266.

HARLOW, CHRIS Innovation and Productivity under Nationalization. The First Thirty Years. London: George, Allen and Unwin, 1977. Pp. 256. Index.

Contents - Introduction - Aircraft innovation and its effect on productivity in B.E.A. - Power station performance: policies for development 1945-75 - The choice

of automatic telephone switching techniques - Process innovation and growth in the gas industry - Mechanized mining and the growth of labour productivity - Productivity and technical change - Conclusions.

HILHORST, J.G.M. Monopolistic Competition, Technical Progress and Income Distribution. Rotterdam: Rotterdam University Press, 1965. Pp. xii + 152. (Economic Series, vol. 3)

HOROWITZ, I "Firm size and research activity," Southern Economic Journal 28 (January 1962): 247-301.

HUMPHREY, P.B. & J.R. MORONEY "Substitution among capital, labour and natural resource products in American manufacturing," Journal of Political Economy 83,1 (February 1975): 57-82.

JEWKES, J. "Monopoly and economic progress," Economica 20,79 (August 1953): 197-214.

Effect of monopoly on innovation.

JOHANNISSON, B. & L. LINDSTROM "Firm size and inventive activity," Swedish Journal of Economics 73,4 (December 1971): 427-442.

KAMIEN, M.I. & N.L. SCHWARTZ
"Market structure, elasticity of demand and incentive to invent," Journal of Law and Economics 13,1 (April 1970): 241-252.

"Timing of innovations under rivalry," Econometrica 40,1 (January 1972): 43-60.

"Market structure, rivals' response, and the firm's rate of product improvement," Journal of Industrial Economics 20,2 (April 1972): 159-172.

KAMIEN, MORTON I. & NANCLY L. SCHWARTZ
Market Structure and Innovation: A Survey. U.S. National Science Foundation, R & D Assessment Programme, Washington, June 1974. Pp. 291.

Literature review and bibliography.

LEONARD, WILLIAM N. Business Size, Market Power and Public Policy. New York: Thomas Y. Crowell Co., Inc., 1969. Pp. xiii + 257. Index.

MANSFIELD, E. "Size of firm, market structure and innovations," Journal of Political Economy 71,6 (December 1963): 556-576.

MARKHAM, J.W. "Market structure, business conduct, and innovation," American Economic Review. Papers and proceedings, 55 (May 1965): 323-32. Cf. comments by Adelman, Griliches and Tybout, pp. 342-46.

MCGEE, JOHN S. In Defense of Industrial Concentration. New York: Praeger Publishers, 1971. Pp. xi + 167. Index.

See pp. 96-123, "Concentration and 'progressiveness': invention, innovation." Critical discussion of work done by Worley, Hamburg, Comanor, Mansfield, Williamson, Scherer on the relationship between innovation and firm size.

MEINHARDT, P. Inventions, Patents and Monopoly. Stevens, 1950. 2nd edition. Pp. xvi + 320.

MORONEY, J.R. The Structure of Production in American Manufacturing. Chapel Hill: University of North Carolina Press, 1972. Pp. xiii + 174. Biblio. Indexes.

Contents: Introduction - The economics of scale - Capital-labour substitution: theory and cross-section evidence - Capital-labour substitution, technological progress and the distribution of income - Factor proportions and comparative advantage - Regional tests of the Heckscher-Ohlin hypothesis - Summary.

NEEDHAM, DOUGLAS "Market structure and firms' R & D behaviour," Journal of Industrial Economics 23,4 (June 1975): 241-255.

NG, Y.K. "Competition, monopoly, and the incentive to invent," Australian Economic Papers 10 (June 1971).

PEARL, D.J. & J.L. ENOS "Engineering production functions and technological progress," Journal of Industrial Economics 24,1 (September 1975): 55-72.

PHILLIPS, A. "Concentration, scale and technological change in selected manufacturing industries, 1899-1939," Journal of Industrial Economics 4,3 (June 1950): 179-193.

PHILLIPS, A. "Patents, potential competition and technical progress," American Economic Review, Papers and Proceedings 56 (May 1966): 301-10.

PHILLIPS, ALMARIN Technology and Market Structure. A Study of the Aircraft Industry. Lexington, Mass.: Heath Lexington Books, 1971. Pp. xviii + 233. Index.

Chapter 1 - general overview, discussion of theories of Schumpeter and Galbraith, Chapters 2-8 - study of aircraft industry.

PIORE, MICHAEL On the Technological Foundations of Economic Dualism. M.I.T. Paper No. 110, 1973.

ROSENBERG, JOEL B. "Research and market share: a reappraisal of the Schumpeter hypothesis," Journal of Industrial Economics 25,2 (December 1976): 101-112.

SCHERER, F.M. "Firm size, market structure, opportunity and the output of patented inventions," American Economic Review 55,5 part 1 (December 1965): 1097-1125.

SCHERER, F.M. "Market structure and the employment of scientists and engineers," American Economic Review 52,3 (June 1967): 524-531.

Critical examination of Schumpeter's theories on the relation between monopoly power and technological innovation.

SCHERER, F.M. "Research and development resource allocation under rivalry," Quarterly Journal of Economics 81 (August 1967): 359-94.

SCHERER, FREDERIC M. Industrial Market Structure and Economic Performance. Chicago: Rand McNally and Company, 1970. Pp. xi + 576. Author, subject and law case indexes.

See particularly chapter 15 "Market structure and technological innovation," Pp. 346-378.

SCHERER, FREDERIC The Economies of Multi-Plant Operation: An International Comparisons Study. Cambridge, Mass.: Harvard University Press, 1975.

SCHOTT, KERRY "The relations between industrial research and development and factor demands," Economic Journal 88,349 (March 1978): 85-106.

SILBERTSON, A. "Economies of Scale in theory and practice," Economic Journal 82 (1972): 369-391.

SOLO, C. "Innovation in the capitalist process: a critique of the Schumpeterian theory," Quarterly Journal of Economics 65 (August 1951): 417-428.

SWAN, P.L. "Market structure and technological progress: the influence of monopoly on product innovation," Quarterly Journal of Economics 84 (November 1970): 627-638. See comment by L.J. White and reply by Swan, Quarterly Journal of Economics 86 (1972): 342-349.

SYLOS-LABINI, PAOLO Oligopoly and Technical Progress. Revised edition. Cambridge, Mass. 1969, originally published Milan 1957. Trans., Elizabeth Henderson. Pp. 237. Index. Biblio.

TERLECKYJ, NESTOR . Effects of R & D on the Productivity Growth of Industries: An Exploratory Study. National Planning Association, Washington, 1974.

TURNER, D.F. & O.E. WILLIAMSON "Market structure in relation to technical and organizational innovation," in J.B. Heath, ed., International Conference on Monopolies, Mergers and Restrictive Practices, HMSO, 1971.

U.S. SENATE. COMMITTEE ON THE JUDICIARY. Subcommittee on Antitrust and Monopoly, Hearings, Concentration, Invention, and Innovation. 89th Congress. Washington, D.C.: U.S.G.P.O., 1965.

VERNON, JOHN M. Market Structure and Industrial Performance: A Review of Statistical Findings. Boston: Allyn and Bacon, Inc., 1972. Pp. xiii + 140. Biblio. pp. 121-136 (Industrial organization). Index.
This study examines the theoretical model attributing the performance of an industry to the industry's structure. (degree of concentration, product differentiation, barriers to entry); empirical studies are reviewed; this theoretical model is of interest as it underlies public policy.

VILLARD, H.H. "Competition, oligopoly and research," Journal of Political Economy 66,6 (December 1958): 483-497.

See criticism by J. Schmookler, "Bigness, fewness and research," Journal of Political Economy 67,6 (December 1959): 628-633; with reply by Villard, pp. 633-635.

WESTFIELD, F.M. "Technical progress and returns to scale," Review of Economics and Statistics 48,4 (November 1966): 432-441.

WHITE, J.L. "Appropriate technology, x-inefficiency, and a competitive environment: some evidence from Pakistan," Quarterly Journal of Economics 90,4 (November 1976): 575-89.

WHITE, J.L. "The failure of entrepreneurs in LDC's to adopt appropriate technology has been attributed to inappropriate factor prices and to the absence of competitive markets. Though the former proposition has been extensively tested, the latter has not. This article formalizes the latter proposition, relates it to x-inefficiency arguments, and tests it on a sample of Pakistan industries. It appears that a more competitive environment does force Pakistani entrepreneurs to adopt more labour-intensive technologies, which are more appropriate for Pakistan. Even in LDC's, competition matters."

WILLIAMSON, O.E. "Innovation and market structure," Journal of Political Economy 73,1 (February 1965): 67-73.

WORLEY, J.S. "Industrial research and the new competition," Journal of Political Economy 49,2 (April 1961): 183-186.

2.3.2 International Aspects

ATLANTIC INSTITUTE The Technology Gap: U.S. and Europe. New York: Praeger, 1970. Pp. xi + 154. Biblio.

Contents: Introduction - The technology gap - Consequences of the technology lag - Why the technology lag - Technological strategies - The myth and challenge of the technological gap - The causes of Atlantic technological disputes.

BALASSA, BELA & ASSOCIATES The Structure of Protection in Developing Countries. Baltimore: John Hopkins University Press, 1971. Pp. xviii + 375. Biblio.

Trade barriers and restrictions as barriers to economic development, analysis using measures of 'effective protection': Part I: concepts and measures of protection - Patterns of economic structure, growth and trade - Nominal and effective protection in seven countries - Evaluation of the system of protection - guidelines for industrial protection policy. Part II: structure of protection in Brazil, Chile, Mexico, West Malaysia, Pakistan, Philippines, Norway. Appendices. Index.

BARNET, RICHARD J. & RONALD E. MULLER Global Reach: The Power of Multinational Corporations. New York: Simon and Sohuster, 1974. Pp. 508. Index.

Critical, negative view of multinationals. See particularly chapter 7, "The engines of development," chapter 11, "The obsolescence of American labour."

BROOKFIELD, HAROLD Interdependent Development. London: Methuen, 1975.

CROOKELL, H. The Role of Product Innovation in Trade Flows. School of Business Administration, University of Western Ontario, London, Ontario, 1970. Pp. 83.

CURZON, GERARD & VICTORIA The Multinational Enterprise in a Hostile World. London: MacMillan, 1977.

Positive view of multinationals.

DASGUPTA, AJIT KUMAR Economic Freedom, Technology and Planning for Growth. New Delhi: Ass. Publishing House, 1973. Pp. 107. Index.

BEHRMAN, JACK N. & HARVEY W. WALLENDER
Transfers of Manufacturing Technology within Multinational Enterprises. Cambridge, Mass.: Ballinger, c. 1976. Pp. xvii + 308.

FATEMI, NASROLLAH S., GAIL W. WILLIAMS & THIBAUT DE SAINT-PHALLE
Multinational Corporations: The Problems and Prospects. A Study Prepared by the Graduate Institute of International Studies, Fairleigh Dickinson University. 2nd revised edition. South Brunswick, N.J.: Barnes; London: Yoseloff (1975) 1976. Pp. 332. Index. Biblio.

"Revised edition, the major revision being the final chapter on recent developments prepared by the third author. This study analyzes the historical evolution of the multinational, particularly the U.S.-based enterprises, and examines the effects of the multinationals on employment, technology transfer, taxation, the balance of payments and national sovereignty." Journal of Economic Literature 15,1 (March 1977): 191.

FINDLAY, RONALD "Relative backwardness, direct foreign investment and the transfer of technology," Quarterly Journal of Economics 92,1 (February 1978): 1-16.

Model of transfer of technology, including role of direct foreign investment, Hypothesis: "the rate of technological progress in a relatively 'backward' region is an increasing function of the gap between its own level of technology and that of the 'advanced' region which improves at a constant rate, and the degree to which it is

open to direct foreign investment, measured by the proportion of foreign capital operating in the backward region to the domestic capital in that region."

GRUBER, W., D. MEHTA & R. VERNON
"The R & D Factor in International Trade and international investment of U.S. industries," Journal of Political Economy 75, (February 1967): 20-37.

GRUBER, WILLIAM H. & DONALD G. MARQUIS, eds.
Factors in the Transfer of Technology. M.I.T. Press, Cambridge, Mass., 1969. (M.I.T. Conference on the Human Factor in the Transfer of Technology.) Pp. xii + 289.

HAYDEN, ERIC W. Technology Transfer to East Europe: U.S. Corporate Experience. New York: Praeger, 1976. Pp. 134. Biblio 121-130.

HAWTHORNE, EDWARD P. The Transfer of Technology. OECD, Paris, 1971. Pp. 148.

HERNES, HELGA The Multinational Corporation: A Guide to Information Sources. Detroit: Gale Research Company, 1977. (International Relations Series, Vol. 4). Pp. 197. Indexes. Annotated biblio.

HORST, T. "Firm and industry determinents of the decision to invest abroad: an empirical study," Review of Economics and Statistics 54 (August 1972): 258-266.

HYMER, STEPHEN HERBERT The International Operations of National Firms: A Study of Direct Foreign Investment. M.I.T. Monographs in Economics, No. 14. Introduction by Charles P. Kindleberger. Cambridge Mass. & London: M.I.T. Press 1976. Pp. xvii + 253.

JOHNSON, HARRY G. Technology and Economic Interdependence. London: MacMillan Press, 1975. (World Economic Issues Series, Trade Policy Research Centre, London. Vol. 2) Annotated biblio. pp. 162-183.

See favourable review by H.C. Eastman, Journal of Economic Literature 15,2 (June 1977): 564-5, and critical review by Chris Freuman, Economic Journal, 86 (September 1976): 636-38. Multinational firm as an effective instrument for the economic development of poor countries; growth, technological change within multinational for ultimate good of all.

KEESING, D.B. "The impact of research and development on United States trade," Journal of Political Economy 75 (February 1967): 38-48.

----- "Labour skills and international trade: evaluating many trade flows with a single measuring device," Review of Economics and Statistics 47 (1965): 287-293.

----- "Labour skills and comparative advantage," American Economic Review, Papers and proceedings, 56 (May 1966): 249-258.

LALL, SANJAYA Foreign Private Manufacturing Investment and Multinational Corporations: An Annotated Bibliography. New York: Praeger, 1975. (Praeger Studies in International Economics and Development.) Pp. ix + 196.

LEA, SPERRY & SIMON WEBLEY Multinational Corporations in Developing Countries: A Review of Recent Research and Policy Thinking. London, Montreal and Washington: British-North America Committee, 1973.

LEONTIEF, W.W. "Factor proportions and the structure of American trade: further theoretical and empirical analysis," Review of Economics and Statistics 38 (November 1956): 386-407.

LOWINGER, T.C. "Human capital and technological determinants of U.S. industries' revealed comparative advantage," Quarterly Review of Economics and Business 17,4 (Winter 1977): 91-102.

----- "The technology factor and the export performance of U.S. manufacturing industries," Economic Inquiry 13 (June 1975): 221-235.

MADDISON, ANGUS Foreign Skills and Technical Assistance in Economic Development. Paris, OECD Development Centre, 1965.

MAIZELS, ALFRED Industrial Growth and World Trade, An Empirical Study of Trends on Production, Consumption and Trade in Manufacturing from 1899-1959, With Discussion of Probable Future Trends. Cambridge: Cambridge University Press, 1963. Pp. xxiii + 563. Biblio.

MASON, R.H. "Some observations on the choice of technology by multinational firms in developing countries," Review of Economics and Statistics 55 (1973): 349-55.

MICHALET, C.A. "The transfer of technology by multinational firms and the absorptive capacity of developing countries." OECD, International meeting of researchers on the transfer of technology by multinational firms, Paris 24-28th November, 1975. Conference document no. 2.

OECD Gaps in Technology. General Report, Paris, 1968.

Technological dependence - multinationals; question of the influence the dependant has on pace and direction of technological advance, ability to use same to fulfill its own economic, social and national objectives.

PARRY, THOMAS G. "Technology and the size of the multinational-corporation subsidiary: evidence from the Australian manufacturing sector," Journal of Industrial Economics 23,2 (December 1974): 125-134.

PAVITT, K. "The multinational enterprise and the transfer of technology," in The Multinational Enterprise, ed. J.H. Dunning. London, 1971. Pp. 61-83.

----- "Technology, international competition and economic growth: some lessons and perspectives," World Politics 25 (January 1973): 183-205.

PICKETT, J., D. FORSYTHE & N. McBAIN "The choice of technology, economic efficiency and employment in developing countries," Overseas Development Administration, February 1973.

POSNER, M.U. "International trade and technical change," Oxford Economic Papers 13 (October 1961): 323-341.

QUINN, J.B. "Technology transfer by multinational companies," Harvard Business Review 3 (Nov-Dec 1969): 147-161.

R & D labs of multinational corporations which maintain an international, interdependent structure (of R & D), not concerning themselves with local needs, function to some extent as "brain drain" in that local talents and skills are not applied to local problems.

RAINE, JOHN S. Multinational Companies and Overseas Direct Investment. A Selected Bibliography. Business Info(rmation) Press, 1975. Pp. 46.

Seminar on Incentives to, and Obstacles Arising in, the Transfer of Technology among ECE countries. U.S. Economic Commission for Europe, Secretariat. Madrid 25-28 September, 1972.

SPENCER, DANIEL LLOYD Technology Gap in Perspective. Strategy of International Technology Transfer. New York: Spartan Books, 1970. Pp. xv + 172. Index.

"This book is offered as a first attempt to view modern technology in an international context. It seeks to show the mechanism of world technology from its origin in the laboratory through its transfer abroad to the economic, political and social changes it generates and the adjustments it requires."

STEELE, R.D. Multinational Corporations, Technology Transfer and Developing Countries. Council of Planning Librarians, Bibliography no. 745, 1975.

STRHARSKY, HARRY & MARY RIESCH
The Transnational Corporation and the Third World: Bibliographical Notes.
CODOC Common Catalogue No. 3.,
CODOC International Secretariat, 1975, Washington, D.C.
1301 entries, Pp. 231. Indexes.

STREETEN, PAUL Foreign Investment, Transnationals and Developing Countries. London: MacMillan, 1977.

----- ed., Trade Strategies for Development. London: MacMillan, 1973.

TEECE, DAVID J. The Multinational Corporation and the Resource Cost of International Technology. Cambridge, Mass.: Ballinger Publishing Company, 1976. Pp. 129. Index. Biblio.

"Examines technology transfers via multinational firms involving the transfers of the capability to manufacture a product or utilize a process. Seeks to examine the mechanics of international corporate technology transfer and to provide evidence on the level and determinants of technology transfer costs using a 'resource cost' definition. Externalities and rents accruing from royalty payments are largely excluded from the definition of costs. The study is limited to transfers to and from the United States. Corporate transfers covered include the licensing of technology to independent corporations and to governments, to joint ventures, and to wholly owned subsidiaries. The data were obtained from interviews and include 29 projects."
Journal of Economic Literature (September 1977): 1037.

U.S. DEPARTMENT OF COMMERCE. PANEL ON INTERNATIONAL TRANSFER OF TECHNOLOGY

Factors Affecting the International Transfer of Technology among Developing Countries. Prepared for U.S. Department of Commerce, Commerce Technical Advisory Board, February 1970, Washington, U.S.G.P.O.

VERNON, RAYMOND, ed.

The Technology Factor in International Trade. New York: National Bureau of Economic Research, Columbia University Press, 1970. Pp. x + 493. Index.

Includes:
Johnson, H.G. "The state of theory in relation to the empirical analysis;"
Bruno, M. "Development policy and dynamic comparative advantage;"
Jones, R.W. "The role of technology in the theory of international trade;"
Chipman, J.S. "Induced technical change and patterns of international trade;"
Hufbauer, G.C. "The impact of national characteristics and technology on the commodity composition of trade in manufactured goods;"
Gruber, W.H. & R. Vernon "The technology factor in a world trade mix,"
plus 3 case studies, an introduction by R. Vernon, and comments on papers by J. Bhagwati, R. Aliber, N. Rosenber, K. Arrow, W. Leontief, C.P. Kindleberger, etc.

WELLS, LOUIS T., ed. The Product Life Cycle and International Trade. Division of Research, Graduate School of Business Administration, Harvard University, Boston, 1972.

WILKINS, MIRA The Maturing of Multinational Enterprise: American Business Abroad from 1940 to 1970. Cambridge, Mass.: Harvard University Press, 1974. Pp. xvi + 590.

According to James W. Vaupel, Journal of Economic Literature 14,3 (September 1970): 930: "The evolution of U.S. business abroad, the cumulative nature of foreign investment, the process of corporate growth - these are the themes and substance of Dr. William's study. No one else has examined this development nearly as carefully or painstakingly as she has."

WILLIAMSON, HAROLD F., ed. Evolution of International Management Structures. Newark: University of Delaware Press, 1975. Pp. xii + 254.

Edited proceedings of a conference held in 1972. Papers by J.K. Galbraith, R.T. Averitt, P. Mathias, H.A. Schmitt, J.M. Laux, S.A. Billon, K. Yamamura, C. Wilson, A.D. Chandler.

2.4 Innovative Process

2.4.1 General

ALLEN, THOMAS JOHN Managing the Flow of Technology: Technology Transfer and the Dissemination of Technological Information within the R & D Organization. Cambridge Mass.: M.I.T. Press c. 1977. Pp. xii + 320. Biblio. Indexes.

ARTHUR D. LITTLE, INC.
Federal Funding of Civilian Research and Development. Michael Michaelis, project director and editor. Prepared for the Experimental Technology Incentives Program, U.S. Dept of Commerce. Boulder, Colorado: Westview Press, 1976.

Part 1 - summary, Pp. 1-55, Part 2 - case studies, Pp. 1-353.
"The primary purpose of this study was to better understand how federal funding of civilian research and development has functioned as an agent of technological change in the private sector. The report is a policy history of six federal R & D programs dealing with central station nuclear power, coal extraction and conversion, motor vehicle safety, urban mass transportation, edible soy-protein and biological pesticides. The results of the study demonstrate that federally funded R & D is not sufficient - by itself - to bring about technological change in the private sector to any significant-extent. Successful commercialization of federally funded R & D is nearly always accompanied by public policy measures that cause or stimulate market demand. Technological innovation is most often pulled into the market place through appropriate incentives, rather than pushed by federally-funded R & D, the report concludes: "Policies for the federal funding of civilian R & D should be formulated in the larger context of the complex process of innovation."

ARTHUR D. LITTLE, INC.
Barriers to Innovation: Opportunities for Public Policy Changes; Executive Summary. Prepared for U.S. National Science Foundation. Research Applied to National Needs (RANN) September 1973. Pp. 34. Washington D.C. Arthur D. Little, Inc.

A survey of opinions of 24 firms, 25 government officials, 22 financiers, 35 labour officials concerning the barriers to innovation they had encountered and their suggestions for policy changes. The results reveal that the most widely perceived barriers related to marketing are both fragmentation of existing markets and lack of information . Other barriers included venture capital and government patent and antitrust policies.

BARNETT, HOMER GARNETT Innovation: The Basis of Cultural Change. Toronto: McGraw-Hill, 1953. Pp. xi + 462. Index.

Process of change, anthropological.

BLAUG, M. "A survey of the theory of process-innovations," Economica, 30,117 (February 1963): 13-32.

BLUME, S. "The sociological literature on research management," Research Policy 2,4 (1973).

BURNS & STALKER The Management of Innovation. London, 1961.

CARTER, C.F. & B.R. WILLIAMS Industry and Technical Progress. Factors Governing the Speed of Application of Science. London: Oxford University Press, 1957. Pp. xiii + 244. Index.

CARTER, C.F. & B.R. WILLIAMS "The characteristics of technically progressive firms," Journal of Industrial Economics 7,2 (March 1959): 87-104.

CENTRE FOR THE STUDY OF INDUSTRIAL INNOVATION
1971 - On the Shelf: A Survey of Industrial R & D Projects Abandoned for Non-Technical Reasons. London, 1971.
1971 - Research and Development Expenditure: A comparison of Industries. London, 1971.
1972 - Success and Failure in Industrial Innovation. London, 1971.

CHARPIE, ROBERT A., Chairman
Technological Innovation: Its Environment and Management. U.S. Department of Commerce. 1967 U.S.G.P.O. Pp. 83.

One of earliest studies on effects of government policy on innovation.

COWING, THOMAS G. "Technical change and scale economies in an engineering production function: the case of steam electric power," Journal of Industrial Economics 23,2 (December 1974): 135-152.

DHRYMES, P.J. & M. KURZ "Technology and scale in electricity generation," Econometrica 32 (1964): 287-315.

FREEMAN, CHRISTOPHER The Economics of Industrial Innovation. Harmondsworth: Penquin, 1974. Pp. 409. Index. Biblio pp. 389-403.

Part 1, The Rise of science related technology,
2, Innovation and the theory of the firm,
3, Innovation and government.

GOLD, BELA "Technology, productivity and economic analysis," OMEGA 1,1 (February 1973): 5-24.

GOLD, BELA, ed. Technological Change: Economics, Management and Environment. Toronto, New York: Pergamon Press, 1975. Pp. xiii + 175.

See review by C. Freeman, Journal of Economic Literature 15,1 (March 1977): 142-3.

GOLD, BELA Explorations in Managerial Economics: Productivity, Costs, Technology and Growth. New York: Basic Books, 1971. Pp. 297. Biblio.

GOLD, BELA "Tracing gaps between expectations and results of technological innovations: the case of iron and steel," Journal of Industrial Economics 25,1 (September 1976): 1-28.

GOLD, BELA "Research, Technological change and economic analysis: a critical evaluation of prevailing approaches," Quarterly Review of Economics and Business 17,1 (Spring 1977): 7-29.

"This article summarizes and appraises the analytical foci, concepts, measures and findings of a large sample of published studies of research and technological innovations from the standpoint of their applicability to

the decision making needs of industrial managements and government officials. Particular emphasis is placed on studies using production functions, total factor productivity and input-output approaches."

GREGORY, R.G. & D.W. JAMES "Do new factories embody best practice technology," Economic Journal, 83 (December 1973): 1133-55. See comment by B.D. Huig and reply 85 (January 1975): 378-88; "new evidence" by S. Gomullca 86 (December 1976): 859-63.

HAMBURG, D. R And D: Essays In the Economics of Research and Development. New York: Random House, 1966. Pp. 170. Index.

HAMBURGER, M., EDWIN MANSFIELD, J. RAPAPORT, J. SCHNEE & S. WAGNER
Research and Innovation in the Modern Corporation. New York: W.W. Norton & Co., 1971. Pp. 227.

HASTINGS, T. "The characteristics of early adapter of new technology: An Australian study," Economic Review June 1976 52 (138): 239-250.

HU, SHENG CHENG "On the incentive to invent: a clarificatory note," Journal of Law and Economics 16,1 (April 1973): 169-177.

JOHNSON, P.S. The Economics of Invention and Innovation, With a Case Study on the Development of the Hovercraft. London: Martin Robertson and Co. Ltd., 1975. Pp. xi + 329. Index.

Part I, general issues in the economic analysis of technological change, including the relationship between the size of firm, R & D spending, invention and innovation; the role of innovation in competition; Part II, discussion of major channels for the production, dissemination and use of scientific and technological knowledge; Part III, case study on the development of the hovercoalt in the U.K.

KATZ, ELIHU "The social itinerary of technical change: two studies on the diffusion of innovation," Human Organization 10,2 (Summer 1961)

the decision making needs of industrial managements and government officials. Particular emphasis is placed on studies using production functions, total factor productivity and input-output approaches."

GREGORY, R.G. & D.W. JAMES "Do new factories embody best practice technology," Economic Journal, 83 (December 1973): 1133-55. See comment by B.D. Huig and reply 85 (January 1975): 378-88; "new evidence" by S. Gomullca 86 (December 1976): 859-63.

HAMBURG, D. R And D: Essays In the Economics of Research and Development. New York: Random House, 1966. Pp. 170. Index.

HAMBURGER, M., EDWIN MANSFIELD, J. RAPAPORT, J. SCHNEE & S. WAGNER
Research and Innovation in the Modern Corporation. New York: W.W. Norton & Co., 1971. Pp. 227.

HASTINGS, T. "The characteristics of early adapter of new technology: An Australian study," Economic Review June 1976 52 (138): 239-250.

HU, SHENG CHENG "On the incentive to invent: a clarificatory note," Journal of Law and Economics 16,1 (April 1973): 169-177.

JOHNSON, P.S. The Economics of Invention and Innovation, With a Case Study on the Development of the Hovercraft. London: Martin Robertson and Co. Ltd., 1975. Pp. xi + 329. Index.

Part I, general issues in the economic analysis of technological change, including the relationship between the size of firm, R & D spending, invention and innovation; the role of innovation in competition; Part II, discussion of major channels for the production, dissemination and use of scientific and technological knowledge; Part III, case study on the development of the hovercoalt in the U.K.

KATZ, ELIHU "The social itinerary of technical change: two studies on the diffusion of innovation," Human Organization 10,2 (Summer 1961)

MANSFIELD, E. "Technical change and the rate of imitations," Econometrica 29,4 (October 1961): 741-766.

----- "Intrafirm rates of diffusion of an innovation," Review of Economics and Statistics 45 (November 1963): 348-359.

----- "The speed of response of firms to new techniques," Quarterly Journal of Economics 77 (May 1963): 290-311.

----- "Industrial research and development expenditures, determinants, prospects and relation to size of firm and inventive output," Journal of Political Economy 72,4 (August 1964): 319-340.

MANSFIELD, EDWIN Industrial Research and Technological Innovation. An Econometric Analysis. New York: W.W. Norton, 1968. Pp. xviii + 235. Biblio.

----- et al Research and Innovation in the Modern Corporation. New York: W.W. Norton, 1971.

----- The Production and Application of New Industrial Technology. New York: W.W. Norton, 1977. Pp. x + 220. Index.

Contents: The production of new industrial technology - Organizational and strategic factors associated with probabilities of success in industrial R & D - Innovation, development and size of firm in the chemical industry - The innovation and development processes within the firm - An econometric analysis of development costs - Determinants of the speed of application of new technology - The diffusion of numerically controlled machine tools in ten manufacturing industries - Social and private rates of return from industrial innovations - The case studies: a closer look at the benefits and costs of industrial innovations - Conclusions.

MILLER, ROGER EMILE Innovation, Organization and Environment. A Study of Sixteen American and West European Steel Firms. Institut de Recherche et de Perfectionnement en Administration, Université de Sherbrooke, Sherbrooke, Que., 1971. Pp. xv + 211. Biblio.

MYERS, SUMNER & DONALD G. MARQUIS Successful Industrial Innovations: A Study of Factors Underlying Innovation in Selected Firms. National Science Foundation, May 1969.

NABSETH, L. & GEORGE F. RAY The Diffusion of New Industrial Processes. An International Study. London: Cambridge University Press, 1974. Pp. xvi + 324. Biblio.
Cf. review by K.J.W. Alexander in Economic Journal 85,338 (June 75): 429-430.

NIESR study, Diffusion of new processes in 10 industries in 7 countries; rates of diffusion in those countries; possible explanation of differences i.e. technical applicability, profitability, finance, size structures and organization, management attitudes; and other studies of individual processes.

NELSON, R.R. "The simple economics of basic scientific research," Journal of Political Economy 67 (1959): 297-306.

----- "The economics of invention: a survey of the literature," Journal of Business 32, 1959.

NORRIS, K. & J. VAIZEY The Economics of Research and Technology. London: Allen and Unwin, 1973.

OECD The Conditions for Success in Technological Innovation. OECD, Paris, 1971. Pp. 169. Biblio.

PARKER, JOHN E.S. The Economics of Innovation: The National and Multinational Enterprise in Technological Change. London: Longman, 1974.

Cf. review by Keith Norris, Economic Journal 85,339 (September 1975): 671-2. Focus on the firm; innovative process; multinationals in technological transfer.

PAVITT, KEITH Government and Technical Innovation. Paris, OECD, 1966.

Need for government involvement to exploit future opportunities for technological innovation effectively; managerial and technological competence incentives; labour force adaptation measures.

----- The Conditions for Success in Technological Innovation. OECD, Paris, 1971. Pp. 170.

ROMEO, A.A. "The rate of imitation of a capital-embodied process innovation," Economica 4,173 (February 1977): 63-69.

"This article examines the rate of imitation of an important innovation, numerically controlled machine tools. From an empirical analysis based on data from 10 U.S. manufacturing industries the author draws 3 principal

inferences. First, different industries seem to react quite differently to the same innovation. Second, these differences are explainable in part by certain industry characteristics, including its degree of competitiveness. Third, the use of a rate of imitation rather than some alternative measure of the rate of diffusion does not appear to affect significantly the first two conclusions."

RUBENSTEIN, A.H. "Organization and research and development decision-making within the decentralized firm," Pp. 385-393 in National Bureau of Economic Research, The Rate and Direction of Inventive Activity. Princeton: Pr. Univ. Press,62

----- "Economic evaluation of R & D: a brief survey of theory and practice," Journal of Industrial Economics 17,11 (1966): 615-20.

RUTTAN, U.W. "Usher and Schumpeter on invention, innovation and technological change," Quarterly Journal of Economics 73 (November 1959): 596-606.

SAUL, S.B. "The nature and diffusion of technology," Pp. 36-61 in A.J. Youngson, ed., Economic Development in the Long Run, London, 1972.

SCHMOOKLER, JACOB Invention and Economic Growth. Cambridge Mass.: Harvard University Press, 1966.

SCHON, D.A. "Champions for radical new inventions," Harvard Business Review 41,2 (March-April 1963): 77-86.

SHANKS, MICHAEL The Innovators: The Economics of Technology. Penquin, Harmondsworth, Middlesex, 1967.

SCHMOOKLER, J. & O. BROWNLEE "Determinants of inventive activity," American Economic Review, Papers and Proceedings, 52 (May 1962): 165-176.

STRASSMAN, P.W. "The risks of innovation in 20th century manufacturing methods," Technology and Culture 6 (Spring 1964): 215-223.

STRASSMAN, PAUL W. Risk and Technological Innovation: American Manufacturing Methods During the Nineteenth Century. Ithaca, N.Y.: Cornell University Press, 1959. Pp. x + 249. Biblio. Index.

UTTERBACK, J.M. "Innovation in industry and the diffusion of technology," Science (February 1974): 183-191.

2.4.2 Industry Studies

What follows ia a small, unsystematic sample of studies of innovation and technical change in specific industries. Case studies are included in the works of Gold, Johnson, Languish et al, Layton, Miller, Myers and Marquis, and Nabseth, cited in the previous section; for others see the M.I.T. bibliography listed below, the bibliographies published annually in Technology and Culture, and the sections on industry studies and the economics of technical change in the Journal of Economic Literature.

ADAMS, W. & J.B. DIRLAM
"Big Steel, invention and innovation," Quarterly Journal of Economics 80,2 (May 1966): 167-189.

-----"Steel imports and vertical oligopoly power," American Economic Review 54,5 (September 1964): 626-655.

Technological leadership, rate of innovation.

BROWN, W.H. "Innovation in the machine tool industry," Quarterly Journal of Economics 71,3 (August 1957): 406-425.

CAHN, R.W. "Case histories of innovations," Nature Vol. 225 (February 21, 1970): 693-5.

COMANOR, W.S. "Research and technical change in the pharmaceutical industry," Review of Economics and Statistics 47,2 (May 1965): 182-190.

ENOS, J.L. "Invention and innovation in the petroleum refining industry," Pp. 299-322 in National Bureau of Economic Research, The Rate and Direction of Inventive Activity, Princeton, N.J.: Princeton University Press, 1962.

FREEMAN, C., A. YOUNG & J.K. FULLER
"The plastics industry: a comparative study of research and innovation," National Institute Economic Review 26 (November 1963): 22-62.

FREEMAN, CHRISTOPHER, C.J.E. HARLOW & J.K. FULLER
"Research and development in electronic capital goods," National Institute Economic Review No. 34 (November 1965): 40-89. (M.I.T. biblio. 837)

FREEMAN, CHRISTOPHER "Economics and innovation in the pharmaceutical industry," Chemistry and Industry (March 28, 1970): 428-429. (M.I.T. biblio. 840)

*FREEMAN, CHRISTOPHER "Chemical process plant: innovation and the world market," National Institute Economic Review 45 (August 1968): 29-57. (M.I.T. biblio. 826)

JERVIS, P. "Innovation in electron-optical instruments," Research Policy 1,2 (1972): 174

KURZ, M. & A.S. MANNE "Engineering estimates of capital labour substitution in metal machining," American Economic Review 53,4 (September 1963): 662-681.

MADDALA, G.S. & P.T. KNIGHT "International diffusion of technical change: a case study of the oxygen steel making process," Economic Journal 77,307 (September 1967): 531-558.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY. CENTRE FOR POLICY ALTERNATIVES

An Annotated Bibliography with Index for Technology Policy Studies. 2nd Edition. M.I.T., 7 May 1975. Pp. 418.

Prepared with use of computer; organized by "keywords," with author and title indexes. Partially annotated. Includes studies of innovation in specific industries.

MUELLER, W.F. "The origins of the basic inventions underlying Du Pont's major product and process innovations, 1920 to 1950," Pp. 323-353 in National Bureau of Economic Research, The Rate and Direction of Inventive Activity, Princeton, N.J.: Princeton University Press, 1962.

NATIONAL ACADEMY OF ENGINEERING

Application of Technology to Improve Productivity in the Service Sector of the National Economy. Summary report and recommendations based on a symposium and workshops held on the occasion of the 8th annual meeting, November 1 + 2, 1971, at the National Academy of Engineering, Washington, 1973. (National Research Council, Publication No. 2041.)

PECK, M.J. "Inventions in the Postwar American aluminum industry," Pp. 279-298 in National Bureau of Economic Research, The Rate and Direction of Inventive Activity Princeton, N.J.: Princeton University Press, 1962.

SCHWARTZMAN, D. Innovation in the Pharmaceutical Industry. London: Johns Hopkins University Press, 1977. Pp. xvi + 399. (cf. review by T. Barva, pp. 147-8 Economic Journal 88,349 March 1978).

2.5 Canadian Studies

2.5.1 The Canadian Economic and Industrial Climate

2.5.1.1 General

BRETON, ALBERT A Conceptual Basis for an Industrial Strategy. Economic Council of Canada, Ottawa, 1974.

BRITTON, J.N.H. "The influence of corporate organization and ownership of the linkages of industrial plants: a Canadian inquiry," Economic Geography 52,4 (October 1976): 311-324.

CANADIAN FORUM Special Symposium on Industrial Strategy. January-February, 1978.

CAVES, R.E. & R.H. HOLTON The Canadian Economy: Prospect and Retrospect. Cambridge: Harvard University Press, 1959.

COMPETITION POLICY IN THE CONTEXT OF A CANADIAN INDUSTRIAL STRATEGY
Summarizing discussion at the 7th McGill Government-Industry Conference. Held at Mentebello P.Q., November 1972. Pp. 24.

COPITHORNE, LAWRENCE W., ed., A Neoclassical Perspective on Natural Resource-LED Regional Economic Growth. Economic Council of Canada. Pp. ii + 56. Discussion paper no. 92, Ottawa, July 1977.

Natural Resources and Regional Disparities. A Skeptical View. Economic Council of Canada, Discussion paper no. 106, Ottawa, 1978.

DALY, D.J., B.A. KEYS, E.J. SPENCE
Scale and Specialization in Canadian Manufacturing. Staff study no. 21, Economic Council of Canada, 1968.

EASTERBROOK, W.T. & HUGH G.J. AITKEN
Canadian Economic History. Toronto: MacMillan, 1956.

"Staples" approach, therefore best on primary and transport, weakest on manufacturing, business-government relations after 1930. Cf. particularly Chapter 11, The new industrialism, role of technology in Canadian economic development, pp. 515-522; Chapter 13, Changing patterns in investment and trade, pp. 572-580.

FIRESTONE, O.J. Regional Economic Development. Ottawa: University of Ottawa Press, 1974. Pp. xi + 274. Index.

Consists of a criticism of regional growth theory by H.W. Richardson, & studies of Canadian regions and Canadian policies.

GORECKI, P. Economies of Scale and Efficient Plant Size in Canadian Manufacturing Industries. Bureau of Competition Policy, Research Monograph No. 2. Department of Consumer & Corporate Affairs, Ottawa, 1976.

Contents: Introduction and summary - Some notes on Economies of scale in a Canadian context - Two techniques for estimating efficient plant size - The determinants of plant sizes in 56 Canadian manufacturing industries: 1966 and 1972 - Economies of scale, tariffs, market size, exports, industry growth and concentration in 17 Canadian manufacturing industries - Concepts of efficient plant size, economies of scale and enterprise concentration - Conclusions - Appendices - References.

GRAY, JOHN A. Stability of Employment and Production Within Canadian Resource-Based Industries. Centre for Settlement Studies, Series 2, Research Report no. 23, University of Manitoba, Winnipeg, 1975. Pp. v + 65. Biblio.

GREEN, ALAN Regional Aspects of Canada's Economic Growth. Toronto: University of Toronto Press, 1971.

HECHT, M.R. & J.P. SIEGAL A Study - Manufacturing Firms in Canada, with Special Emphasis on Small and Medium Sized Firms. Office of Science and Technology, Department of Industry Trade and Commerce, Ottawa, August 1973.

JONES, J., L. LAUDADIO & M. PERCY "Market structure and profitability in Canadian manufacturing industry: some cross-section results," Canadian Journal of Economics (August 1973): 356-368.

KETTLE, J. "Problems ahead for natural resources," Executive (February 1978): 28-38.

LaTOURETTE, J.E. "Economies of scale and capital utilization in Canadian manufacturing 1926-72," Canadian Journal of Economics 8 (August 1975): 448-55.

LITHWICK, N.H. Economic Growth in Canada: A Quantitative Analysis. Toronto: University of Toronto Press, 1969.

MARTIN, FERNAND Regional Aspects of the Evolution of Canadian Employment. Ottawa: Economic Council of Canada, 1976. Pp. viii + 110. Biblio.

Using the shift-and-share method of analysis, this study considers the regional and structural aspects of the changes in Canadian employment between 1961-70.

MAY, J. DOUGLAS & MICHAEL DENNY "Investment incentives and employment opportunities: a case study in Canadian manufacturing," Unpublished paper, Institute for Policy Analysis, Toronto, 1977.

An investigation of the effects on employment and costs of the accelerated capital cost allowance measures and income tax rate decreases introduced in Canada in 1972; concludes that the cost reduction is insufficient to maintain employment level through an expansion in demand created by lower prices, and that while the demand for capital and materials is increased the demand for labour in manufacturing is decreased. See also D. May, "Canada's new industrial strategy ," Unpublished paper, Acadia University, 1977.

OKSANEN, ERNEST H. & JAMES R. WILLIAMS "International cost differences - a comparison of Canadian and United States manufacturing industries," Review of Economics and Statistics 60,1 (February 1978): 96-101.

Comparison of industrial cost and employment characteristics in manufacturing in the two countries. Pairwise comparisons of means; multivariate and discriminant analysis lead to a conclusion of systematic differences on basis of these variables: no. employees/establishment, production workers/establishment, production workers/no. of employees, payroll/$ value added, wages/$ value added, value added/$ of shipments, wage/production employee (deflated by payroll/employee).

PORTER, ALLAN A. Productivity, Costs and Prices. An Examination of Trends in Selected Manufacturing Industries. Economics and Research, Labour Canada, Ottawa, 1973. Pp. vii + 366.

POSTNER, HARRY H. An Analysis of Canadian Manufacturing Productivity. Some Preliminary Results. Economic Council of Canada, Staff Study No. 31, Ottawa, May 1971. Pp. v + 129.

Contents: Introduction - Some descriptive results - An analysis of labour productivity growth - Capital productivity growth analysis - Factor productivity growth analysis - Resource shift analysis and productivity growth - Suggestions for further research.

ROSENBLUTH, G. Concentration in Canadian Manufacturing Industries. Princeton, National Bureau of Economic Research. Princeton University Press, 1952.

Role of American investment.

SCHRAMM, GUNTER, ed. Regional Poverty and Change. Canadian Council on Rural Development, Department of Regional Economic Expansion, 1976. Pp. 317. Biblio.

Includes: Beckman, M.J. "The impact of scientific and technical change on the location of economic activities." Schramm, G. "Technological change, scale economies and location."

SCIENCE COUNCIL OF CANADA Uncertain Prospects: Canadian Manufacturing Industry, 1971-1977. Science Council on Industrial Policies, Science Council of Canada, Ottawa, October 1977.

SKEOCH, LAWRENCE A. et al
Dynamic Change and Accountability in a Canadian Market Economy. Proposals for a further Revision of Canadian competition policy by an independent committee appointed by the Minister of Consumer and Corporate Affairs, Ottawa, 1976.

WOODWARDS, R.S. "The capital bias of DREE incentives," Canadian Journal of Economics 7,2 (May 1974): 161-173.

WALDIE, K. "Productivity and competitiveness in Canadian manufacturing," Canadian Labour (December 1977): 8-11.

WATKINS, M. "A staple theory of economic growth," Canadian Journal of Economics and Political Science 29 (May 1963): 141-158.

2.5.1.2 Foreign Investment

AITKEN, HUGH G., ed. The American Economic Impact on Canada. Durham N.C. & Duke University Press, 1959.

AITKEN, HUGH G.J. American Capital & Canadian Resources. Cambridge, Harvard University Press, 1961.

Survey of the developments to the 1950's.

CANADA. DEPARTMENT OF INDUSTRY, TRADE AND COMMERCE
The International Enterprise. Foreign Investment in Canada.

Bibliographies; frequently updated.

CANADA Foreign Direct Investment in Canada. ("Gray Report")
Ottawa, Information Canada, 1971.

CAVES, RICHARD EARL Diversification, Foreign Investment and Scale in North American Manufacturing Industries.
Ottawa: Economic Council of Canada, 1975. Pp. 76.

CAVES, R.C. "Multinational firms, competition and productivity in host-country markets," Economica 41 (May 1974): 176-93.

CORDELL, ARTHUR J. The Multinational Firm, Foreign Direct Investment and Canadian Science Policy.
Ottawa: Queen's Printer, December 1971.
Science Council of Canada, Background study #22.

CROOKELL, H. & L. WRIGLEY
"Canadian response to multinational enterprise,"
Business Quarterly (Autumn 1973): 52-61.

FAYERWEATHER, JOHN Foreign Investment in Canada. Prospects for National Policy. Toronto: Oxford University Press. 1974. Pp. 200. Index.

Contents: A historical perspective - Canadian attitudes toward foreign investment - National decision-making processes - Industrial strategy - National policy on foreign investment.

GLOBERMAN, S. "Canadian science policy and technological sovereignity," Canadian Public Administration 4,1 (Winter 1978): 34-45.

Postive and apologetic concerning technological effects of multi-national enterprises. Argues against the position of the Science Council of Canada, the need for technological sovereignity.

LEVITT, KARI Silent Surrender: The Multinational Corporation in Canada. Toronto: Macmillan, 1970.

LITVAK, I.A., C.J. MAULE, R.D. ROBINSON
Dual Loyalty. Canadian-U.S. Business Arrangements. Toronto: McGraw Hill Company of Canada Ltd., 1971. Pp. xi + 242. No index.

"The first part contains a historical background of Canadian-U.S. relations, with the emphasis being on economic factors, particularly the problems that have arisen and policies which have been adopted and recommended in Canada. In Part II, the reader is introduced to the seven case studies of U.S. companies and their Canadian affiliate operations. Part III provides an analysis of the cases for two purposes, to interpret the commercial behavior of these companies in the context of the Canadian-U.S. setting and to derive policy implications for Canada. The study also includes, in appendix form, a listing of existing Canadian laws with respect to foreign investment, a number of relevant Canadian-U.S. treaty arrangements and agreements, and a selected bibliography on the general subject of Canadian-U.S. economic relations."

LITVAK, I.A. & C.J. MAULE "Branch plant entrepreneurship," Business Quarterly (London, Ontario) 37,2 (Summer 1972)

MARSHALL, HERBERT, FRANK A. SOUTHARD JR., & KENNETH W. TAYLOR
Canadian-American Industry. A study in International Investment. New Haven: Yale University Press, 1936. Toronto: McClelland & Stewart, 1976.

PAQUET, GILLES, ed.
The Multinational Firm and the Nation State. Don Mills, Ontario: Collier-Macmillan, Canada, 1972. Pp. 181. Biblio.

RAY, D. MICHAEL Regional Aspects of Foreign Ownership of Manufacturing in Canada. University of Waterloo, Waterloo Ontario, 1967. Pp. xiv + 126.

The tendency toward the unequal centre-periphery relations generally associated with economic development has been augmented in Canada by the extent of U.S. ownership of the manufacturing industry; external factors are found to be more important than internal ones in explaining the distribution of U.S. controlled manufacturing employment in Canada, i.e. most important factors are the distance of the U.S. metropolitan area of the parent company from the Canadian community, (head office accessibility) the amount of manufacturing activity in the U.S. metro area,

market potential in the Canadian centre, and whether Toronto is an intervening location opportunity. The author concludes that foreign controlled, and particularly U.S. controlled, employment displays greater regional disparities and much greater geographic concentration than domestically controlled manufacturing employment, thus widening inter-regional disparities in Canada.

REUBER, GRANT L. & FRANK ROSEMAN
The Take-Over of Canadian Firms, 1945-1961: An Empirical Analysis. Economic Council of Canada, Special Study no. 10, Ottawa, 1969. Pp. 242.

ROTSTEIN, ABRAHAM The Precarious Homestead: Essays on Economics, Technology and Nationalism. Toronto: New Press, 1973.

SAFARIAN, A.E. Foreign Ownership of Canadian Industry. Toronto: McGraw-Hill, 1966.

----- "Foreign investment in Canada: some myths," Journal of Canadian Studies, 1971.

SCHEINBERG, STEPHEN "Invitation to Empire: Tariffs and American economic expansion," in Cuff, Robert and Porter, Glenn, eds., Enterprise and National Development Toronto: Hakkert, 1973. Pp. 138.

2.5.1.3 International Trade, Tariffs and Barriers to Trade

BAUMANN, H. "Structural characteristics of Canada's pattern of trade," Canadian Journal of Economics 9 (August 1976): 408-425.

BEIGIE, CARL E. The Canada-U.S. Automotive Agreement: An Evaluation. Canadian-American Committee, Montreal, 1978.

BOND, DAVID E. & RONALD J. WONNACOT Trade Liberalization and the Canadian Furniture Industry. Toronto: Private Planning Association of Canada and University of Toronto Press, 1968. Pp. 56.

CANADA. AUTOMOTIVE TASK FORCE Review of the North American Automotive Industry. Automotive Task Force. Department of Industry, Trade and Commerce, Ottawa, 1977.

CAVES, RICHARD E. The Political Economy of Tariff Structures. Kingston, Ontario: Institute of Economic Research, Queen's University, January, 1975. Pp. 31.

An essay advancing competing models of the political decision making process to explain the pattern of (effective) protective tariffs in Canadian secondary manufacturing industries.

CROOKELL, H. "From Auto Pact to Appliance Pact," Business Quarterly, Spring 1970.

Progress from introduction of new product into Canada to complete production of item in Canada. (Cordell SCC #22 p. 47)

DALES, J.H. The Protective Tariff in Canada's Development. Toronto, University of Toronto Press, 1966.

DALY, D.J. & S. GLOBERMAN Tariff and Science Policies: Applications of a Model of Nationalism. Ontario Economic Council Research Series. Toronto: University of Toronto Press, 1976.

Tariff protection the primary cause of low productivity; argument for trade liberalization.

DAUPHIN, ROMA The Impact of Free Trade in Canada. Economic Council of Canada, Ottawa, 1978.

EASTMAN, H.C. & STEFAN STYKOLT
The Tariff and Competition in Canada. Toronto: Macmillan of Canada, 1967. Pp. xvi + 400. Index.

"This study of the structure and behavior of sixteen industries contributing nearly ¼ of value added in manufacturing industry in Canada indicates that the Canadian tariff has not in fact led to the establishment of efficient industries in Canada, i.e. industries that minimize their costs by producing in plants of optimal scale and thus achieve lowest average costs, given input prices as they prevail in Canada at a particular time . . . The scope given by the tariff to incurring excess costs of production tended in fact to result in actual overcrowding of industries with plants at sub-optimal size, "The analysis of the 16 industries of this study suggests that foreign control in manufacturing activity as a whole is in part brought about by the tariff. It reveals that economies of scale and oligopolistic behavior in a small market created by the tariff are important factors in favouring foreign control."

ECONOMIC COUNCIL OF CANADA Looking Outward. Ottawa, 1975.
Some evidence on protection, productivity, and foreign ownership and its effects. Mainly focuses on trade options.

ENGLISH, H. "Specialization and export agreements: their potentials and limitations," in L.A. Skeoch ed., Canadian Competition Policy, Industrial Relations Centre, Kingston, Ontario, 1972.

EMERSON, DAVID L. Production, Location and the Automotive Agreement. Economic Council of Canada, Ottawa, 1975. Pp. vii + 93.
Contents: Introduction to the study - Profile of the automotive industries in North America - Quantifying industry production relationships - Locational cost analysis - Implications for the automotive agreement.

GORDON, M.J. "A world scale national corporation industrial strategy," Canadian Public Administration 4,1 (Winter, 1978): 46-56.

Presents theoretical and empirical arguments for an industrial strategy, as opposed to unrestricted international trade. Direct critique of Wonnacot (Canadian Journal of Economics, 1975).

HAVILAND, W.E., N.S. TAKACSY & E.M. CAPE
Trade Liberalization and the Canadian Pulp and Paper Industry. Toronto: Private Planning Ass'n. of Canada and University of Toronto Press, 1968.

JOHNSON, HARRY G., PAUL WONNACOTT, & HIROFUMI SHIBATA
Harmonization of National Economic Policies Under Free Trade. Toronto: Private Planning Association of Canada and University of Toronto Press, 1968.

LYON, PEYTON VAUGHN Canada-United States Free Trade and Canadian Independence. Economic Council of Canada, Ottawa, 1975.

MELVIN, JAMES R. & BRUCE W. WILKINSON
Effective Protection in the Canadian Economy. Special Study no. 9, Economic Council of Canada, August 1968. Pp. 76. Biblio.

This study reviews the concept of effective protection, computes the nominal and effective tariffs for 133 industries in the Canadian Census of Manufacturers, 1963. It is concluded that, in general, the effective tariffs are 1½ to 2 times higher than the nominal rates; however, for approximately 25% of the industries the nominal rates are higher than the effective, and for 5.2% of the industries, effective protection is actually negative. Interpretation, discussion of effects on prices and productivity.

POSTNER, HARRY H. Factor Content of Canadian International Trade: An Input-Output Analyses. Ottawa, Economic Council of Canada, 1975. Pp. 184.

Contents - Introduction - description of data base and related methodology - Factor content of Canadian total trade, 1961-70 - Factor content of Canadian bilateral trade 1967 - Factor content of Canadian manufacturing trade 1961-70 - Factor content of Canadian exports (to import leakages), 1967 - Correlation analysis between factor-intensity and the Canadian tariff structure - Factor impact of multilateral free trade, 1970. Conclusion, appendixes.

QUIRIN, G. DAVID Trade Liberalization and the Mineral Industries. Toronto: Private Planning Association of Canada and University of Toronto Press, 1968.

SHEARER, RONALD A., JOHN H. YOUNG, & GORDON R. MUNRO Trade Liberalization and a Regional Economy: Studies of the Impact of Free Trade on British Columbia. Toronto: Private Planning Association of Canada and University of Toronto Press, 1971.

Contents: Introduction (Shearer) - The economy of British Columbia (Shearer) - The regional impact of free trade (Shearer) - The traditional export industries (Young) - The import-competing sector (Munro) - An estimate of the gains from North Atlantic free trade (Shearer).

SINGER, JACQUES J. Trade Liberalization and the Canadian Steel Industry. Toronto: Private Planning Association and University of Toronto Press, 1969. Pp. 140. Biblio.

SKEOCH, L.A. Restrictive Trade Practices in Canada. Toronto: McClelland and Stewart, 1966.

STEGEMAN, CLAUS Canadian Non-Tariff Barriers to Trade. Canadian Economic Policy Committee, Sponsored by the Private Planning Association of Canada, no date.

STYKHOLT, S. & H.C. EASTMAN The Tariff and Competition in Canada. New York: St. Martin's Press, 1967.

TRANT, GERALD I., DAVID L. MCFARLANE, LEWIS A. FISCHER Trade Liberalization and Canadian Agriculture. 1968.

WILKINSON, BRUCE W. & K. NORRIE
Effective Protection and the Return to Capital. Ottawa: ECC, 1975. Pp. viii + 100.

Using two approaches, that of "effective protection" and that of "returns-to-capital," this study attempts a survey of the Canadian economy (1961, 1966, 1970) as background to a determination of the effects of and resource shifts which would result from trade liberalization.

WONNACOT, R.J. Canada's Trade Options. Economic Council of Canada, Special Report, Ottawa, 1975.

WONNACOT, R.J. & P. WONNACOT Free Trade Between the U.S. and Canada: The Potential Economic Effects. Cambridge, Mass: Harvard University Press, 1967.

WONNACOTT, R.J. "Industrial strategy: a Canadian substitute for trade liberalization?" Canadian Journal of Economics 8,4 (November 1975): 536-547.

Evidence for existence of unexploited economies of scale; arguments for reciprocal free trade or 'go it alone' in eliminating tariffs. For a response see M.J. Gordon, "A world scale national corporation industrial strategy," Canadian Public Administration 4,1 (Winter, 1978): 45-56.

2.5.2 Technological Innovation in Canada

BALDWIN, B. "Taxation policy," Canadian Labour (December 1977): 20-77.

Incentives for innovation and employment.

BOURGAULT, PIERRE L. Innovation and the Structure of Canadian Industry. Ottawa: Information Canada, October 1972. Science Council of Canada, Background study no. 23.

BOYD, A.D. & A.H. WILSON Technology Transfer in Contruction. Science Council of Canada, Background study no. 32. Ottawa, January 1975.

CORDELL, A.J. & J.M. GILMOUR The Role and Function of Government Laboratories and the Transfer of Technology to the Manufacturing Sector. Science Council of Canada, background study no. 35. Ottawa, April 1976. Pp. 397. Biblio 379-392.

CROOKELL, H. "The transmission of technology across national boundaries," Business Quarterly. (Autumn 1973): 52-61.

ECONOMIC COUNCIL OF CANADA Report on Intellectual and Industrial Property. Economic Council of Canada, Information Canada, Ottawa, 1971. Pp. x + 236.

Contents: Introduction - Innovation, information, knowledge - Economic significance of intellectual and industrial property - Patents in a Canadian perspective - Patents: policy recommendations - Industrial design - Copyright - Trademarks - Conclusion.

ENGLISH, H.E. "Industrial organization and technical progress." Pp. 114-137 in T.N. Brewis, ed., Growth and the Canadian Economy. Toronto: McClelland and Stewart, 1968.

FIRESTONE, O.J. "Innovations and economic development: the Canadian case." Pp. 175-235 in O.J. Firestone, ed., Economic Growth Reassessed. Ottawa: University of Ottawa Press, 1972.

GAGNE, WALLACE "Technology and Canadian politics." Pp. 9-51 in Wallace Gagne, ed., Nationalism, Technology and the Future of Canada. Toronto: MacMillan, 1976.

GELLMAN, H.S. & R.C. CARROLL Practical Application of Data Processing in Medium Sized and Smaller Manufacturing Companies. A paper prepared for the conference, "productivity through new technology," sponsored by Economic Council of Canada and Ontario Economic Council, 1965. Ottawa: Queen's Printer, 1965.

GILMOUR, J. "Industrialization and technological backwardness: the Canadian dilemma," Canadian Public Policy 4,1 (Winter 1978): 20-33.

GLOBERMAN, S. "Market structure and R & D in Canadian Manufacturing," Quarterly Review of Economics and Business. 13 (Summer 1973): 59-68.

Regression analysis on single industry statistics. Conclusion: against merger-strategy and in favour of industry specific R & D support.

----- "Technological diffusion in the Canadian tool and die industry," Review of Economics and Statistics (1975) Pp. 428-34.

GRASLEY, ROBERT H. The Availability of Risk Capital for Technological Innovation and Invention in Canada. Ministry of State, Science and Technology, Ottawa, 1975. Pp. vi + 80. Biblio 75-80.

"The Canadian capital market is examined to determine a) funding capability; b) investor attitudes; c) past and present trends." Three areas of activity are considered: the inventive, entrepreneurial, and managerial. The author finds "risk-aversion" to be high among investors; a shortage of high-risk funds, especially for the more innovative, small companies. The role of the income tax act in increasing the availability of funds is considered.

HOWE, J.D. & D.G. McFETRIDGE
"The determinants of R & D expenditures," Canadian Journal of Economics 9,1 (February 1976): 57-71. Biblio.

LEWIS, C.B. A Survey of Canadian Activity in Transportation R & D. Science Council of Canada, Background study no. 17. Ottawa, May 1971.

LITHWICK, H.N. Canada's Science Policy and the Economy. Toronto: Methuen, 1969. Pp. ix + 176. Index. Biblio.

"This book is based on a study prepared for the Task Force on the Structure of Canadian Industry, and its three parts provide perspectives on the three central issues in science policy - how does science contribute to our national goals, how are we using scientific resources at present, and what are the problems with the current approach to science."

MACCRIMMON, K.R. & W.T. STANBURY "Risk attitudes of U.S. and Canadian top Managers," Office of Science and Technology, Department of Industry, Trade and Commerce, Ottawa, September 1973.

MEYBOOM, P. Technological Innovation in Canada. Economic Development Division, Department of Finance, Ottawa, December 1970.

McFETRIDGE, D.G. Government Support of Scientific R & D: An Economic Analysis. Ontario Economic Council Research Studies, Toronto, 1972.

POST, G. "Productivity and technology in the Canadian regions," Labour Gazette (January 1978): 29-34.

RICHARDSON, R.R. et al The Role of Innovation in the Mining and Mining Supply Industries. Ottawa: Energy, Mines and Resources Canada, Minerals, c. 1976. (Mineral Bulletin MR146)

SCIENCE COUNCIL OF CANADA Innovation in a Cold Climate: The Dilemma of Canadian Manufacturing. Report No. 15, SCC, Ottawa, October 1971.

SCIENCE COUNCIL OF CANADA Technology Transfer: Government Laboratories to Manufacturing Industry. Report No. 24. December 1975.

SINCLAIR, BRUCE, NORMAN R. BALL & JAMES O. PETERSEN, eds. Let Us Be Honest and Modest: Technology and Society in Canadian History. Toronto: Oxford University Press, 1974.

SINCLAIR, GEORGE "Perpetuating fallacies about innovation in Canadian Industry," Science Forum (Toronto) February 1972.

STEAP, H. & G. GRENIER 1970 Experimental Survey of Technological Innovation. Internal Report, Science Statistics Section, Department of Industry, Trade and Commerce, Ottawa, September 1972.

WILSON, ANDREW H. Background to Invention. Science Council of Canada, Background study no. 11, 1970. Pp. 75.

"The main purpose of this study has been to assess the effectiveness of the Canadian patent system and its administration and to receive suggestions with regard to improvements in both the policy and the administration of the system. The study also enabled the author to look into the performance of research and development activities in certain Canadian companies, with particular reference to the effectiveness of certain direct and indirect incentive measures." Based on interviews (August 67-April 68) with 80 companies, from major industrial groups across Canada, and with agencies, institutes, individuals pertinent to problems.

WILSON, ANDREW H. Governments and Innovation. Ottawa: Information Canada, April 1973. Science Council of Canada, Background study no. 26. Pp. 275.

Report dealing primarily with the influence of public sector on technological innovation in Canadian manufacturing, considering the structure of government, The attitude of government towards industry, industrial assistance programs, federal government purchasing and research transfer programs, taxation, and regional development programs; a chapter on industrial financing and one on trade, tariffs and non-tarrif barriers.

----- Science, Technology and Innovation. Economic Council of Canada, Special study no. 8. Ottawa, Queen's Printer, May 1968.

3. TECHNOLOGY AND MANPOWER

3.1 General Studies

ARMSTRONG, DOUGLAS AND MARIAN DWORACZEK
Plant Closures, Terminations and Layoffs. A Bibliography. Research Library, Ontario Ministry of Labour, Toronto, September 1973. Pp. 29. Books, articles, not annotated.

Effects on labour of plant closures, terminations of layoffs; questions of relocation, retraining, job dislocation, unemployment. Includes various case studies of specific industries, occupations, classes of workers (i.e. older, younger); both American and Canadian.

BEACH, E.F. "The statics and dynamics of innovation," Relations Industrielles Relations. 31,4 (1976): 676-681.

"It has long been agreed that if the demand for a commodity is elastic, the reduction in labour requirement through technological change will be offset enough to maintain the workers in employment. We shall show this to be a doubtful analysis, and suggest the need of an alternative approach to explain the increases in employment that have characterized past economic growth."
i.e. former is a static approach; dynamic one needed, - for example, one considering the income effects of the new investment.

----- "Technological unemployment: a failure in theorizing," Relations Industrielles Relations. 31 (1): 122-32, 1976.

----- "A Naive Argument," Relations Industrielles . 29 (2): 403-5, 1974.

"Compensation controversy" (that those disemployed through technological change cannot be expected to be reabsorbed in the making of the machinery that displaced them because if they were the savings in unit costs, which was the rationale for change, would not exist) is reconsidered. Beach states that this is a long-run on partial equilibrium approach which does not consider the speed of mechanization. Increasing mechanization entails increasing capital investment and therefore is on balance a positive short run influence on the employment rate, reinforced by long-run effects of improvements in productivity.

BIENSTOCK, HERBERT The Impact of Technological Change on the Labour Market. New York, 1973. (Conference on Labour, New York University, Proceedings no. 25)

BLAIR, LARRY M. Mechanisms for Aiding Worker Adjustment to Technological Change. Vol. 1. Conceptual Issues and Evidence. Human Resources Institute, Utah University, Salt Lake City, 1973.

The effect of technological change on the labour market in relation to the production function, price, skill, demand shifts; adjustment mechanisms; literature review; bibliography.

BLUM, A. Technology and Unemployment: A Comparative Study. Michigan State University, School of Labour and Industrial Relations, East Lansing, Mich., 1970.

-----"Technology and unemployment: a comparative study," Relations Industrielles 25 (1970): 485-509.

BOWEN, HOWARD R. & GARTH L. MANGUM, eds. Automation and Economic Progress. Englewood Cliffs, N.J.: Prentice-Hall, 1966.

Condensation of the Report on the National Commission on Technology, Automation and Economic Progress, 1966.

BROZEN, Y. "Automation's impact on capital and labour markets," in H.B. Jacobson and J.S. Roucek, Automation and Society, New York, 1959.

----- "The economics of automation," American Economic Review 47 (May 1957): 339-385.

"A technical discussion of several different types of automation classified by causes and by capital and labour demand effects."

BROZEN, YALE Automation: The Impact of Technological Change. Washington, D.C. Institute for Public Policy Research, 1963. Pp. 47.

----- Automation and Jobs. Selected Papers no. 18, Graduate School of Business, University of Chicago, 1965.

BUMAS, L.O. "The effects of an advance in technology on employment in an industry: a theoretical model," Engineering Economist 14,4 (Summer 1969): 215-220.

BURACK, E.H. & P.F. SORENSON JR.
"Manpower development and technological change: some consideration for revised strategies," The Journal of Management Studies Vol. 8 (October 1971): 304-314.

BURACK, E.H. & F.H. COSSELL
"Technological change and manpower developments in advanced production systems," Academy of Management Journal 10 (September 1967): 293-308.

BURACK, ELMER H. & THOMAS J. McNICHOLS
Human Resource Planning: Technology, Policy, Change. Kent, Ohio: Comparative Administration Research Institute of the Center for Business and Economic Research, Kent State University, c. 1973.
(Comparative Administration Research Institute, Series no. 6) Biblio. pp. 137-150.

CANADA. DEPARTMENT OF MANPOWER AND IMMIGRATION.
Adjusting to technological and other change.
Ottawa: Information Canada 1970.

CLAGUE, EWAN & L. GREENBERG
"Technological change and employment," Monthly Labour Review 85,7 (July 1962): 742-746.

-----"Employment." Pp. 114-131 in Automation and Technological Change. (The American Assembly, Columbia University.) Englewood Cliffs: Prentice-Hall, 1962.

DANKERT, CLYDE E. "Technological Change and Unemployment." Labor Law Journal 10,6 (June 1959): 393-404.

Discussion of opinions about and attitudes toward technological change; advantages and disadvantages of public policies to reduce technological displacement or its impact.

----- "Views on machinery and unemployment," The Scientific Monthly (February 1940): 155-162.

Views of early writers i.e. Mill, Say.

ECONOMIC COUNCIL OF CANADA A Declaration on Manpower Adjustments to Technological and Other Change. 1966 Economic Council of Canada, Ottawa, 1967. Pp. 14.

FRANCIS, JOHN P. "Manpower implications of technological change in Canada," Labor Law Journal 14,8 (August 1963): 661-69. Cf. "discussion" by G.G. Somers, pp. 669-676.

Based on studies 1957-61 done by Department of Labour, Francis states that considerable changes in both quantity type of manpower required per unit of output have occurred in Canadian industry and that very extensive shifts in manpower between occupations, industries and areas have been necessary as a result. Article does not detail the changes but comments on "the implications of these changes for education and training, for the functioning of the labour market, and for collective bargaining."

FECHTER, ALAN Forecasting the Impact of Technological Change on Manpower Utilization and Displacement: An Analytic Summary.

Washington, D.C.: The Urban Institute, 1975.

GOURVITCH, ALEXANDER Industrial Change and Employment Opportunity - A Selected Bibliography. Work Projects Administration, National Research Project, Report No. 6-5, Philadelphia, Pa., July 1939.

----- Survey of Economic Theory on Technological Change and Employment. New York: AM Kelley, 1966. First published 1940. Pp. xiii + 252. Author index.

JAFFE, ABRAHAM J. & JOSEPH FROOMKIN
Technology and Jobs; Automation in Perspective. New York: F.A. Praeger, 1968.

HAASE, PETER E. "Technological change and manpower forecasts," Industrial Relations 5,3 (May 1966): 59-71.

HABER, WILLIAM, LOUIS A. FERNAW & JAMES R. HUDSON
The Impact of Technological Change; The American Experience. Kalamazoo, Mich.: WE Upjohn Institute for Employment Research, 1963.

INTERNATIONAL LABOUR ORGANIZATION
Automation and Non-Manual Workers. Labour and Automation Bulletin no. 5. Geneva, 1967. Pp. 113. Index. Biblio.

Contents: Introduction - Impact on conditions of work and employment - Effects on the demand for non-manual labour and on employment - Trade Unions and the automation of non-manual work - Summary.

HILL, SAMUEL E. & FRED H. HARRISON Manpower and Innovation in American Industry. Princeton, Department of Economics and Sociology, Industrial Relations Section, Princeton University, 1959. Pp. 85.

LEBERGOTT, STANLEY Manpower in Economic Growth: The American Record Since 1800. New York: McGraw Hill Book Co., Pp. xii + 561.

KING, ALLAN G. "The effects of technological change on productivity, the marginal product of labour, and the labour share." Industrial and Labour Relations Forum vol. 5 (June 1968): 221-233.

KHROMOV, P. "Scientific and technical progress and labour productivity," Problems of Economics 15,3 (July 1972): 46-59.

KREPS, JUANITA M., ed. Technology, Manpower and Retirement Policy. New York: World Publishing Company, 1966. Pp. 197. No Index.

A collection of papers written for a seminar sponsored by the Committee on Employment and Retirement of the National Council on Aging; mainly concerned with the impact of technological change on the older worker.

LONG, CLARENCE D. "Manpower implications of technological change: a symposium," Labor Law Journal 14,8 (August 1963): 655-676.

MACKAY, D.I. & G.L. REID "Redundancy, unemployment and manpower policy," Economic Journal 82 (December 1972): 1256-72. Comment by T. Lancaster, Economic Journal 86,342 (June 1976): 335-338.

Examination of the effects of personal attributes, labour market and job search variables, and manpower policy measures on the length of unemployment after redundancy (in Britain). Conclusions: age most important personal attribute; length of unemployment inversely related to speed of initiation and intensity of job search. Policy implications.

MANGUM, G.L. "Cybernation and job security," Labor Law Journal 17,1 (January 1966): 11-20.

NEW YORK. DEPARTMENT OF LABOR. DIVISION OF RESEARCH AND STATISTICS Manpower Impacts of Industrial Technology. New York, 1969.

Survey of 229 industrial establishments 28 cases of technological change, between 1962 and 1966. Conclusions: 1) elimination of jobs in most cases, but most workers reassigned to different jobs, and only one quarter of workers separated from employment. Displacement and

separation of workers proportionally greater in small establishments than in larger ones. 2) Greatest net changes (highest displacement rates) for conventional (assembly, packaging, material handling) than for more advanced types of automation. 85% of jobs manned by existing work force. 3) Skill requirements for two-thirds of workers, no change; no pronounced tendency for upwards or downwards shift in skill contents of jobs.

OECD The Requirements of Automated Jobs. Final Report and Supplement. North American Joint Conference, Washington D.C., December 1964. Manpower and Social Affairs Directorate, Social Affairs Division, Paris, 1965.

Final Report:
Crispo, JHG, "Summary report: (pp. 7-52).
Borkin, S. "Manpower problems and management in an automated age." (pp. 53-66).
Supplement: texts of papers prepared for the conference, statements of discussants, summaries of floor discussions.

I. The Economic Setting of Automation
Greenberg, L. "Technological change, productivity and employment in the United States." (pp. 13-36).
Francis, J.P. "Technological change, productivity and employment in Canada." (pp. 37-48).
Wolfbein, S.L. "The pace of technological change and the factors affecting it." (pp. 49-69).

II. The Impact of automation on occupational employment patterns, Job Content and Working Conditions.
Schonning, G. "Effects of changing industrial structure on occupational trends." (pp. 89-102.)
Clague, E. "Effects of technological change on occupational employment patterns in the U.S." (pp. 103-118).
Levine, L. "Effects of technological change on the nature of jobs." (pp. 119-160).
Crossman, ERFW "European experience with the changing nature of jobs due to automation." (pp. 161-185).

III. Facilitating Worker Adjustment to Technological Change
Weber, A.R. "Variety in adaptation to technological change: the contribution of collective bargaining." (pp. 205-230).
Bluestone, I. "Automation, collective bargaining and beyond." (pp. 231-242).
Brooks, G.G. "Advance planning for manpower planning at the plant level." (pp. 243-260).

IV. The Adjustment Process for Individuals
Goodwin, R.C. "Labour force adjustment of workers affected by technological change." (pp. 277-292).
Sheppard, H.L. "Mobility, methods of job search, and motivation of displaced workers." (pp. 293-318).

V. Contribution of Education and Training to Worker Adjustment to Technological Change.
Rogers, V.M. "Implications of automation for education." (pp. 329-338).
Boynton, R.E. "Implications of technological change for training programmes in industry." (pp. 339-344).
Walsh, J.P. "Implications of government sponsored train-in programmes." (pp. 345-356).
Dymond, W.R. "Implications of automation for government sponsored training programmes in Canada." (pp. 357-370).

PAUKERT, FELIX "Technological Change and the level of employment in Western Europe." British Journal of Industrial Relations 6,2 (July 1968): 139-155.

Using 3 indicators of technological change (rate of growth of labour productivity, technical progress aspect of the Cobb-Douglas production function, ICOR (L)) and 4 indicators of the level of employment (unemployment rate, change in unemployment rate, growth of the active labour force, index of labour utilization co-efficient) the relation between technological change and employment in Western European countries between 1949 and 1959 is examined, at the national level and at the industry and sector level. Conclusions: 1) growth of labour productivity proved to be a good indicator for the rate of technological change 2) during 1949-59, technological change was not associated with a worsening employment situation, countries with greater technological change improved their employment position more than other countries, but findings 1960-65 do not support this; 3) employment in particular industries and sectors is adversely affected by technological change.

PEITCHINIS, STEPHEN G. Effects of Technological Changes on Employment and Education and Skill Requirements. An Annotated Bibliography. Department of Economics, University of Calgary. January 1978. Pp. 63.

Titles collected through computer search. Articles and books; only partially annotated.

PIORE, MICHAEL J. "The impact of the labour market upon the design and selection of productive techniques within the manufacturing plant." Quarterly Journal of Economics 82 (November 1968): 602-620.

SCHIFF, E. The Primary Employment Effects of Productivity Gains. Chicago: Council for Technological Advancement, 1954.

TATARINOVA, N. "Scientific-technical progress and female labour," Problems of Economics 17,3 (July 1974): 41-53.

TAVISS, I. & W. GERBER Technology and Work. Research review no. 2. Program on Technology and Society, Harvard University, Cambridge, Mass., 1969.

UNITED NATIONS. ECONOMIC AND SOCIAL COUNCIL. COMMISSION ON THE STATUS OF WOMEN.
Repercussions of scientific and technological progress on the conditions of work and employment of women. Report by the International Labour Office, Geneva, 1970.

UNITED STATES DEPARTMENT OF LABOUR. BUREAU OF EMPLOYMENT SECURITY.
Experience of Other Countries in Dealing with Technological Unemployment. Washington, D.C. GPO 1963.

The 'Mack' Project. Washington, 1964.

Work Force Adjustment to Technological Change. Washington G.P.O. 1963.

UNITED STATES. NATIONAL COMMISSION ON TECHNOLOGY, AUTOMATION AND ECONOMIC PROGRESS.
Report. Technology and the American Economy. Washington, D.C. USGPO, 1966. Pp. 115.

Appendixes:
I The Outlook for Technological Change and employment.
II The employment impact of technological change.
III Adjusting to change.
IV Educational implications of technological change.
V Applying technology to unmet needs.
VI Statements relating to the impact of technological change.

Appendix Vol II. Pp. 397. Includes:
Bureau of Labour Statistics "Disemployment of labour at the establishment level." Pp. II 3-25.
Bright, J.R. "The relationship of increasing automation and skill requirements." Pp. II 203-221.
Horowitz, M.A. & I.L. Irwin "Changes in the skill requirements of occupations in selected industries." Pp. II 225-287.
Walker, C.R. "Changing character of human work under the impact of technological change." Pp. II 292-315.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH
Automation: A Report on the Technical Trends and Their Impact on Management and Labour. London, HMSO, 1956.

WELTON, I. Redundancy and Re-Employment Success: A Survey of Research. Research Branch, Ministry of Labour, Ontario, January 1975. Pp. 45.

WILLIAMS, BRIAN C. Manpower Management in Canada: A Selected Bibliography. Bibliography Series no. 3. Industrial Relations Centre, Queen's University, Kingston, Ontario, 1968.

Pp. 9-16: impact of automation and technological change.

WILLIAMSON, J.G. "Capital accumulation, labour saving and labour absorption once more." Quarterly Journal of Economics 85 (1971): 40-65.

3.2 Structural Changes in the Labour Force

BAUER, P.T. & B.S. YAMEY "Economic progress and occupational distribution," Economic Journal 61 (December 1951): 741-755.

BELL, DANIEL The Coming of Post-Industrial Society. New York: Basic Books, 1973: cf. also J.I. Gershuny, "Post-Industrial society, the myth of the service economy," Futures 9 (April 1977): 1-3, 114.

BRANDWEIN, S. "Manpower Implications of technological change: research findings of the U.S. Department of Labor." Labor Law Journal 14,8 (August 1963): 655-661. Cf. "discussion" G.G. Somers pp. 669-76.

Brief overview of U.S. research. Comments on decreasing demand for agricultural, production and blue collar workers, increasing demand for professional, technical and skilled craftsmen, geographic shifts in demand; some policy consideration and suggestions for further research.

BROWNING, HARLEY L. & JOACHIM SINGELMANN
The Emergence of a Service Society: Demographic and Social Aspects of the Sectoral Transformation of the Labour Force in the USA. National Technical Information Service, Springfield Va., 1975.

CARTER, ANNE P. Structural Change in the American Economy. Harvard Studies in Technology and Society. Harvard University Press, Cambridge, Mass, 1970.

MELTZ, NOAH M. Changes in the Occupational Composition of the Labour Force. 1931-1961. Ottawa, 1965.

Examination of changes in industrial structure with relation to occupational structure, the latter is primary concern.

MCINNIS, R. MARVIN "Long-run changes in the Industrial structure of the Canadian work force." Canadian Journal of Economics 4,3 (1971): 353-61. Reprinted in Larry F. Moore, ed. Manpower Planning for Canadians. An Anthology. Institute of Industrial Relations, UBC, 1975.

Comparison of the structure of the Canadian labour force 1911 - 1961; discussion of issues relating to interpretation of similar changes in industrial structure.

MUELLER, EVA Technological Advance in an Expanding Economy: Its Impact on a Cross-Section of the Labour Force. Ann Arbor: Institute for Social Research, University of Michigan, 1969.

SINGELMANN, J. "The sectoral transformation of the labour force in seven industrialized countries, 1920-1970." American Journal of Sociology 83,5 (1978): 1224-234.

SORRENTINO, C. "Comparing employment shifts in 10 industrialized countries," Monthly Labor Review. (October 1971): 3-11.

3.3 Changes in Job Content, Skill and Educational Requirements.

BARANENKOVA, T. "Technical progress and the movement of personnel in industry," Problems of Economics 13,5 (September 1970): 23-43.

BARBASH, JACK "Technology and labour in the twentieth century." In Melvin Kranzburg and Carroll W. Pursell Jr., eds., Technology in Western Civilization. New York: Oxford University Press, 1967.

BEISHON, R.J. "Ergonomics and automation," in Denis Pym, ed., Industrial Society: Social Sciences in Management Harmondsworth: Penquin, 1968.

The effects of mechanization on skill requirements.

BEZDEK, ROGER H. & BARRY GETZEL "Alternative forecasts of the job content and skill requirements of the U.S. economy in 1980." Technological Forecasting and Social Change. 5,2 (1973): 205-214.

BRIGHT, JAMES R. Automation and Management. Division of Research, Graduate School of Business Administration, Harvard University, Cambridge, Mass., 1958. Pp. xv + 270. Index.

See "The impact of automation on the work force," pp. 170-197, re changes in skill requirements, demand for skills.

BROWN, MURRAY & JOHN S. DE CARI
"A measure of technological unemployment," Review of Economics and Statistics 45,4 (November 1963): 386-394.

BRUNHELD, G. & R.H. BURTON
"A theory of technical unemployment - one aspect of structural unemployment," American Journal of Economics and Sociology 26,3 (July 1967): 265-277.

"The theory presented in this paper incorporates the type of 'structural unemployment' which we call 'technical unemployment,' into a Keynesian model in order to demonstrate the complementary relationship between the two theories of unemployment." Technical unemployment is due to a skill being in much reduced demand due to technological change.

CAIN, GLEN G. "The challenge of segmented labour market theories to orthodox theory: a survey," Journal of Economic Literature 14,4 (December 1976): 1215-1257.

COLLINS, RANDALL "Where are educational requirements for employment highest," Sociology of Education 47,4 (Fall 1974): 419-442.

CONANT, E.H. & M.D. KILBRIDGE "An interdisciplinary analysis of job enlargement: technology, costs and behavioral implications," Industrial and Labour Relations Review. 18 (1965): 377-395.

COUNCIL FOR TECHNOLOGICAL ADVANCEMENT Automation and Job Trends. Chicago: Council for Technological Advancement, 1955.

CROSSMAN, EDWARD R.F.W. & STEPHEN LANER
The Impact of Technological Change on Man-Power and Skill Demand; Case Study, Data and Policy Implications. Berkeley, California: Department of Industrial Engineering and Operations Research, University of California, 1969. Prepared for Man-Power Administration, U.S. Department of Labour.

DOERINGER, PETER B. & MICHAEL J. PIORE
Internal Labour Markets and Manpower Analysis. Lexington, Mass: Heath, 1971. (prepared for Man-Power Administration, U.S. Department of Labour.) Pp. viii + 214. Index.

See "Technological change and adjustments in job content.".

DYMOND, W.R. "Technological changes and their impact on employment and occupations," Ottawa, Department of Labour, 1961. Pp. 25. Mimeo.

----- "Technological changes and their impact on employment and occupations," Ottawa, Department of Labour, 1961. Pp. 35. Mimeo.

"Manpower Implications of Technological Change," Ottawa, Department of Labour, 1962. Pp. 24. Mimeo.

"The impact of Technological change on manpower development," Ottawa, Department of Labour, 1964. Pp. 21 Mimeo.

FAUNCE, WILLIAM A. "Automation and the division of labour," Social Problems 13,2 (Fall 1965).

GILPATRICK, ELEANOR G. Structural Unemployment and Aggregate Demand. A Study of Employment and Unemployment in the United States, 1948-1964. Baltimore: Johns Hopkins Press, 1966. Pp. xviii + 235. Index.

An examination of the structural change and low of aggregate-demand theories of unemployment, concluding that explanation of the high unemployment rates in the U.S. in the period under study must be in terms of a combination of these two theoretical positions.

GREGORY, T.E. "Rationalization and technological unemployment," Economic Journal 40,4 (December 1930): 551-567.

KAMRANY, NAKE M. "Technology: measuring the socio-economic impact of manufacturing automation," Socio-Economic Planning Sciences 8 (October 1974): 281-292.

Hypothesizes about economic and social consequences of 'programmable automation' (computers) in manufacturing. Impact on manufacturing industries, international trade, price stability, employment, industry structure and location, and on the environment.

KILLINGSWORTH, CHARLES C. "Implications of automation for employment and manpower planning," in Simon Marcson, ed., Automation, Alienation and Anomie. New York: Harper and Row, 1970.

NEISSER, H.P. "'Permanent' technological unemployment," American Economic Review, March 1942.

NORRIS, W.K. "Manpower aspects of technical change," International Journal of Social Economics 3,2 (1976).

PENZ, G. PETER Structural Unemployment. Theory and Measurement. Program Development Service, Department of Manpower and Immigration, Ottawa, 1969. Pp. ix + 91. Biblio.

Contents: Introduction - Survey of the theory of structural unemployment - A theoretical model of structural disequilibrium for the measurement of structural unemployment - Application of the structural disequilibrium model of Canadian data - Conclusion. Major conclusion: though there was some increase in the structural unemployment rate, particularly in 1955-56 and 1961-62 (in the period 1953-65) most of the changes in the total unemployment rate were attributable to variations in demand-defficiency unemployment, though structural unemployment appears to be the major component of the total unemployment rate.

PIORE, MICHAEL J. Notes for a Theory of Labour Market Stratification. Department of Economics Working Paper no. 95, Massachusetts Institute of Technology, October 1972.

On the Technological Foundations of Dualism. Department of Economics Working Paper no. 110, Massachusetts Institute of Technology, May 1973.

SCOVILLE, J.G. The Job Content of the Canadian Economy 1941, 1951 and 1961. Special Labour Force Studies no. 3. Dominion Bureau of Statistics, Catalogue no. 71-507, Ottawa, 1967.

SMITH, DAVID C. The Dual Labour Market Theory: A Canadian Perspective. Industrial Relations Centre, Queen's University, Kingston, 1976. Research and Current Issues, Series No. 32. Pp. 38.

Discussion of dual labour market theory from neo-classical viewpoint; limited consideration of its application to the Canadian labour market.

STEIBER, JACK, ed. Employment Problems of Automation and Advanced Technology. An International Perspective. MacMillan, London, 1966.

Includes:
Eckstein, O. "Perspectives on employment under technical change."
Killingsworth, C. "Structural unemployment in the U.S."
Marenco, C. "The effects of the rationalization of clerical work on the attitudes and behavior of employees."
Khell, T.W. "The changing pattern of collective bargaining in the U.S."
Flanders, A. "The problem of consent for change."
Hildebrand, G. "Some alternative views of the unemployment problem in the U.S."

TOURAINE, A. "An historical theory in the evolution of industrial skills," In C.R. Walker, ed., Modern Technology and Civilization. New York: McGraw-Hill, 1962.

WACHTER, MICHAEL L. "Primary and secondary labour markets: a critique of the dual approach," Brookings Papers on Economic Activity 3 (1974): 637-694.

WALKER, CHARLES R. & ROBERT H. GUEST
The Man on the Assembly Line. Cambridge, Mass: Harvard University Press, 1952.

WINDER, JOHN W.L. "Structural unemployment." Pp. 135-220 in Arthur M. Kruger and Noah M. Meltz, eds., The Canadian Labour Market, Readings in Manpower Economics. Centre for Industrial Relations, University of Toronto, 1968.

Review of the theory and evidence for structural unemployment.

3.4 International Aspects

BAER, W. "Technology, employment and development: empirical findings," World Development, February 1976 4 (2): 121-130.

BHALLA, A.S. "Technology and employment: some conclusions," International Labour Review 113,2 (March-April 1976): 189-203.

Discussion of two approaches to the choice use of technologies which use more labour in under developed countries: (1) choice from among the existing production techniques, with greater dissemination of information; (2) concentration of resources to design new and more productive but labour intensive techniques. Review of research; some policy conclusions.

BHALLA, A.S., ed. Technology and Employment in Industry. ILO GENEVA, 1975. Pp. xv + 324.

Concerned with the questions of substitutability of labour for capital, and technological choice in underdeveloped countries. Part I - Issues of concept and measurement, Part II - 8 case studies.
Cf. review by David Morawetz, Journal of Development Economics 3 (1976): 114-116.

BOHNSLAU, HERMAN The Optimum International Division of Labour. Geneva: International Labour Office, 1975. Pp. x + 155.

On the positive results of trade liberalization. Cf. review by Paul Streeten, Economic Journal 86 (June 1976): 403-6.

HAWKINS, ROBERT G. Job Displacement and the Multinational Firm: A Methodological Review. Centre for multinational studies, Washington, D.C.

Effect of foreign investment of U.S. multinationals on U.S. employment situation. Difficult to determine, varies with criteria, not "large" relative to other labour force magnitudes, possibly offset by jobs dependent on foreign operations.

INTERNATIONAL LABOUR ORGANIZATION Social and Labour Policies and Practices of Some European-Based Multinational Enterprises in the Metal Trades. Geneva, 1974.

Training personnel in foreign enterprises for use of technology of multinational rather than adaptation of technologies to the available manpower supply.

KUJAWA, DUANE, ed. American Labour and the Multinational Corporation. New York: Praeger, 1973. Pp. 285.

"Export of jobs" controversy.

LYDALL, H.F. Trade and Employment. Geneva: International Labour Office, 1975. Pp. x + 140.

Discusses the positive effects of trade liberalization. Cf. review by Paul Streeten, Economic Journal 86 (June 1976): 403-406.

MORAWETZ, DAVID "Employment Implications of Industrialization in developing countries: a survey," Surveys of Applied Economics, vol II, Pp. 115-168. (Royal Economic Society and the Social Science Research Council) Biblio 155-66, 168.

Contents: Survey of literature since last survey on subject, Baer and Herve 1966. Introduction - Conflict between output and employment - Output Composition: Inter-industry choice, intra-industry product mix - Choice of techniques: econometric estimates, appropriate technology, small scale industry, capital utilization - Conclusions - Bibliography. "Most of the literature (on the limit of disappointing contribution of the industrial sector to economic growth in developing countries) is directed to three fundamental and inter-related questions: is there necessarily a conflict between increasing employment and increasing output? Which goods should be produced (the output composition problem)? How should they be produced (the choice of techniques problem)? Sections I - III of this survey are organized around these three questions. Policies to increase labour use which have been proposed in the literature are discussed in each section." Concerned primarily with implications of industry for employment of unskilled labour.

OECD The Industrial Relations and Employment Impacts of Multinational Enterprises: An Inquiry Into the Issues. by A. Morgan and R. Blanpain. Paris 1977. Pp. 42.

Based on discussions with government, employer, trade union representatives and academics in 15 member countries (fall 1975). Concerned with difference between national and multinational enterprises regarding balance of power between labour and management: increased centralization decreases accessibility of union and governments to decision-makers; size of enterprise also significant due to more resources, alternatives, "staying-power" in face of union action; effects on employment: little evidence regarding quantity and quality of jobs with the integration of production of division of labour at the international level.

SEN, A.K. "Employment, institutions and technology: some policy issues," International Labour Review 112,1 (July 1975): 45-73.

SEN, AMARTYA KUMAR Employment Technology and Development. A study prepared for the I.L.O. within the framework of the World Employment Program. London: Clarendon Press, 1975. Pp. x + 193. Biblio 165-186. Index.

Concerned with technological choice as a part of employment policy in developing countries; in this, institutional consideration are emphasized.

I Basic Concepts
II Measurement Problems
III Institutions, Technology and Labour
IV Policy Objectives and Employment
V Economic Evaluation
Appendixes: Employment problems and policy in India.
Cf. review by R.S. Eckaus, Journal of Economic Literature 14,2 (June 1976): 514-515.

TRIANTES, S.G. "Economic progress, occupational redistribution, and international terms of trade," Economic Journal 63 (September 1953): 627-37.

3.5 Studies of Specific Industries or Occupations

AMERICAN FOUNDATION ON AUTOMATION AND EMPLOYMENT Automation and the Middle Manager. New York: AFAE, 1966.

BELL, R.M. Changing Technology and Manpower Requirements in the Engineering Industry: A Report on a Study by the Science Policy Research Institute. Brighton: Sussex University Press and the Engineering Industry Training Board, 1972. Pp. 101.

BALL, R. & J.T. FINN "Labor and material requirements for sewer works construction," Monthly Labor Review 99,11 (November 1976): 38-43.

Discusses changes in labour and skill requirements accompanying expanded use of large-capacity machinery.

CAMPBELL, DUNCAN R. & EDWARD B. POWER
Manpower Implications of Prospective Technological Changes in Eastern Canadian Pulpwood Logging Industry.
Ottawa, Queen's Printer, 1966. Pp. 154.
(Department of Manpower and Immigration. Program development Service. Research Monograph no. 1) Biblio.

CANADA. AUTOMOTIVE TASK FORCE
Review of the North American Automotive Industry.
Automotive Task Force, Department of Industry Trade and Commerce, Ottawa, 1977.

Pp. 57-64: labour: employment, skill, productivity.

CANADA. DEPARTMENT OF LABOUR
1957 "Technological changes and skilled manpower: electrical and electronics industry and heavy machinery industry."
1958 "Technological changes and skilled manpower: the household appliance industry."
1960 "Technological changes and skilled manpower: the automobile and parts manufacturing industries."
1960 "Technological changes and skilled manpower: the current status of electronic data processing in Canada."
1961 "Technological changes and skilled manpower: electronic data processing occupations in a large insurance company."
1961 "Technological changes and their impact on employment and occupations." A report prepared for the special committee of the Senate of Canada on Manpower and employment.
"Impact and implications of office automation." Occasional Paper No. 1. Economics and Research Branch.

CARNES, RICHARD B. & HORST BRAND
"Productivity and new technology in eating and drinking places," Monthly Labor Review 100,9 (September 1977): 9-15.

"Labour-saving techniques for preparing meals, the rapidly expanding fast food chains and a decline in the number of drinking places have altered output and hours in the industry." 1958-76. Productivity gains through off-premise preparation of foods, simplification of work processes through improvements in materials, handling and cooking devices, innovations in food preservation methods and equipment. In part, reaction to shortages of skilled kitchen personnel, high turnover.

COHEN, PHILIP "New technologies and changing manpower requirements in Canadian railroads," Labor Law Journal 14,8 (August 1963): 685-693.

Based on study of Maritime area, 1948-60, dieselization and centralized traffic control, use of new and improved materials, electronic data processing, humpyards, integrated merchandise services, piggyback, containerization etc. Productivity changes: i.e. 14% increase in number of car-miles, but decrease in labour input (man-hours) of 34% per car mile; employment down 16%, most affected were maintenance and running trades; increase in clerical and nontrain. Significant increase in skill level of labour force: increase in demands for skilled (maintenance) and semi-skilled (machine operator), decrease in demand for unskilled.

COTTRELL, FRED Technological Change and Labour in the Railroad Industry; A Comparative Study. Lexington, Mass.: Heath, 1970. (Studies in social and economic progress) Biblio.

CRITCHLOW, ROBERT V. "Technology and labour in automobile production," Monthly Labor Review 100,10 (October 1977): 32-35.

"Computers, automatic assembly lines, and other labour saving innovations will create jobs for many specialists but slow demand for semi-skilled workers." By 1985 technical and other changes will alter occupational structure in industry, with employment increasing only in 3 occupational categories (managers and other officials, sales workers, operatives), decreasing in all others (professional and technical, clerical, craft, service, labourers). Discussion of types of changes, diffusion, productivity change, labour's adjustment.

CROSSMAN, EDWARD R.F.W. et al Evaluation of Changes in Skill-Profile and Job-Content due to Technological Change, Methodology and Pilot Results from the Banking Steel and Aerospace Industries. California University, Berkely, 1966.

FULCO, L.J. "How mechanization of harvesting is affecting jobs," Monthly Labor Review 92,3 (March 1969): 26-32.

HUFFSTUTLER, C. & J. DUKE "Product in sawmills increases as labor input declines substantially," Monthly Labor Review 100,4 (April 1977): 33-37.

U.S. "Since 1958, sawmills have implemented a variety of technological innovations, allowing them to maintain output while reducing the workforce by one-third." Consideration of number of employees and employee-hours, no specific consideration of skill requirements.

HUNTER, LAURENCE COLVIN & G.L. REID & D. BODDY
Labour Problems of Technological Change. London: Allen & Unwin c. 1970. (Glasgow University, Department of Social and Economic Research, Social and Economic Studies. New series number 18.)

Discusses printing, steel and chemical industries.

KOTOWITZ, YEHUDA "Capital-labour substitution in Canadian Manufacturing 1926-39 and 1946-61," Canadian Journal of Economics 1 (August 1968): 619-32.

LABOUR GAZETTE "The electric age: will the worker be left behind?' Labour Gazette (Canada) 72 (April 1972): 167-171.

MACDONALD, BRUCE Technological Change and Manpower Requirements to 1975 in Ontario's Mechanical Construction Industry. Ontario, Department of Labour, Research Branch, 1971.

MCDONALD, J.C. Impact and Implications of Office Automation. Occasional Paper No. 1, Economics and Research Branch, Department of Labour, Ottawa, May 1964. Pp. 35.

Contents: Introduction - The concept of 'office automation' - The scope of 'office automation' in Canada - Impact of 'office automation' on employment - Impact on clerks and their jobs - Impact on clerical supervisors and older workers - Effects on conditions of work and employment - Implications for management - Implications for white collar unionization - Conclusion.

MONTHLY LABOR REVIEW "Impact of technological change on Canada's automobile industry," Monthly Labor Review 84,4 (April 1961): 388-92.

O'CARROLL, L.T. "Technology and manpower in non-electrical machinery," Monthly Labour Review 94,6 (June 1971): 56-62.

OECD Training and Demand for High Level Scientific and Technical Personnel in Canada. Paris: OECD, 1966. Pp. 138.

SCHAAFSMA, J. "Capital-labour substitution and the employment function in manufacturing: a model applied to 1949-1972 Canadian data," Quarterly Review of Economics and Business 17,3 (Autumn 1977): 33-42.

"The purpose of this article is to develop for the manufacturing sector an employment function in which factor-substitution is properly incorporated within the framework of the model." Brief review of the literature, presentation of model, empirical test.

SORRENTINO, C. "Comparing employment shifts in 10 countries," Monthly Labour Review 94,10 (October 1971): 3-11.

STURM, H.L. "Technological developments and their effects upon health manpower," Monthly Labor Review 90,1 (January 1967): 1-8.

UNITED STATES. DEPARTMENT OF LABOR. BUREAU OF LABOR STATISTICS. B.L.S. Publications on Productivity and Technology. BLS Report no. 461, 1976.

Lists B.L.S. publications between 1965 and 1976 in four areas: detailed statistical studies of productivity for the U.S. and for particular industries; trends in technology and their effect on manpower and productivity; international trends in productivity; changing labour and material requirements in the construction industry. See also two earlier bibliographies: Productivity: A Selected, Annotated Bibliography, 1965-1971. B.L.S. Bulletin 1776, 1973; and Productivity: A Bibliography. BLS Bulletin 1514, 1966.

-----Adjustments to the Introduction of Office Automation. B.L.S. Bulletin 1276, 1960.

-----Impact of Technological Change and Automation in the Pulp and Paper Industry. B.L.S. Bulletin 1347, October 1962.

-----Manpower Planning to Adapt to New Technology at an Electric and Gas Utility. B.L.S. Bulletin 293, 1965.

-----Outlook for Numerical Control of Machine Tools. B.L.S. Bulletin 1437, 1965.

Also, J.J. Macut "Prospects for numerical control of machine tools," Monthly Labor Review 88,4 (April 1965): 403-406.

-----Impact of Office Automation on the Insurance Industry. B.L.S. Bulletin 1468, 1965.

See also, A. Freedman "Office automation in the insurance industry," Monthly Labor Review 88,11 (November 1965): 1313-19.

-----Technological Trends in Major American Industries. B.L.S. Bulletin 1474, 1966.

-----Manpower Planning for Technological Change - Case Studies of Telephone Operators. B.L.S. Bulletin 1574, 1968.

UNITED STATES. DEPARTMENT OF LABOR. BUREAU OF LABOR STATISTICS. Technology and Manpower in the Textile Industry of the 1970's. B.L.S. Bulletin 1578, 1968.

See also R.N. Zeisel "Technology and labour in the textile industry," Monthly Labor Review 91,2 (February 1968): 49-55.

-----Outlook for Computer Process Control. B.L.S. Bulletin 1658, 1970.

See also A.S. Herman "Manpower Implications of Computer Control in manufacturing," Monthly Labor Review 93,10 (October 1970): 3-8.

-----Railroad Technology and Manpower in the 1970's. B.L.S. Bulletin 1717, 1972.

See also M. Levine "Adjusting to technology on the railroads," Monthly Labor Review 94,6 (June 1971): 56-62.

-----Outlook for Technology and Manpower in Printing and Publishing. B.L.S. Bulletin 1774, 1973.

See also R.V. Critchlow "Technological change in the printing and publishing industry," Monthly Labor Review 93,8 (August 1970): 3-9.

-----Technological Change and Manpower Trends in Five Industries. B.L.S. Bulletin 1856, Washington 1975. Pp. vi + 58.

Deals with pulp and paper, hydraulic cement, steel, aircraft and wholesale trade.

-----Technological Change and Manpower Trends in Six Industries. B.L.S. Bulletin 1817, Washington, 1975. Pp. vi + 66.
Textile mill products, lumber and wood products, tires and tubes, aluminum, hauling, health services.

U.S. NATIONAL COMMISSION ON TECHNOLOGY, AUTOMATION AND ECONOMIC PROGRESS
Washington, D.C. USGPO 1966.

Appendix, Volume II, The employment impact of technological change includes:
Butcher, W.R. "Productivity, technology and employment in U.S. agriculture."
Newhouse, J.P. "Technological change in banking."
Haller, W. "Technological change in primary steelmaking in the U.S., 1947-65."

UNITED STATES SUPERINTENDENT OF DOCUMENTS
Monthly Catalogue of United States Government Publications. Washington, USGPO.

Contains listings of the studies by the Department of Labor on technological change; many of these are on specific industries or occupations.

VICKERY, MARY L. "New technology in laundry and dry cleaning services," Monthly Labor Review 95,2 (February 1972): 54-59.

WASHINGTON. EMPLOYMENT SECURITY DEPARTMENT.
Technological Changes in Sawmill Occupations. 1968

YUDELMAN, MONTAGUE, GAVAN BUTLER & RANADEV BANERJI
Technological Change in Agriculture and Employment in Developing Countries. Paris, Development Centre, OECD, 1971. Pp. 204. (Development Centre Studies. Employment series no. 3)

ZEISEL, ROSE N. "Modernization and manpower in textile mills," Monthly Labor Review 96,6 (June 1973): 18-25.

4. BIBLIOGRAPHIES

ABBOTT, LEWIS F. Social Aspects of Innovation and Industrial Technology. A Survey of Research. Committee for Industrial Technology, Department of Industry. C.F.I.T. Paper no. 1. London: H.M.S.O., 1976. Pp. v + 131. Index. Annotated. 356 entries.

Primarily sociological. 1. Technology, organization and innovation: studies of organizations, organizational change within the firm in terms of work groups, authority structures; 2. Facilitation of innovation; 3. Obstacles to innovation; 4. Technology and work; 5. Technology and management.

BARANSON, J. Technology for Underdeveloped Areas. An Annotated Bibliography. Oxford, Toronto: Pergamon Press, 1967. Pp. 81. Indexes.

I Economic aspects: choice of techniques and factor proportions; growth models; trade aspects.
II Sociocultural influences on technology.
III Products and systems.
IV Institutional arrangements.

CALDWELL, LYNTON, ed. Science, Technology and Public Policy: A Selected and Annotated Bibliography. 2 vols. Prepared for the National Science Foundation by the Program in Public Policy for Science and Technology, Department of Government, Indiana University, Bloomington, Indiana. Revised edition, 1969.

Materials published 1945-1967;
Vol. I Books, monographs, government documents, and whole issues of journals. Pp. 492.
Vol. II Articles in journals. Pp. 544.
Biblio divided into categories, including the philosophy of science and technology, the history of science and technology, nature and impact of science and technology, science and government, legal aspects, scientific and technical personnel, organization and management of R & D. Author and title index.

FERGUSON, EUGENE S. Bibliography on the History of Technology. Cambridge, Mass. + London, The Society for the History of technology and the MIT Press, 1968. (Society for the history of technology, monograph 5). Pp. xx + 347. Index.

Biblio of general works, sources, biographies, government publications, manuscripts, periodicals, etc., and an extensive listing (pp. 213-306) of monographs, articles and biblios on the history of technology in specific subject fields (food production, civil engineering, transportation, energy conversion, etc.). Annotated. Index.

HARDIN, EINAR, WILLIAM B. EDDY & STEPHEN E. DEUTCH
Economic and Social Implications of Automation. An Annotated Bibliography. Michigan State University School of Labour and Industrial Relations, East Lansing, Mich. 1961.

KAMIEN, MORTON T. & NANCY L. SCHWARTZ
Market Structure and Innovation: A Survey.
U.S. National Science Foundation (NSF). R & D Assessment program, Washington. June 1974. Pp. 291.

Biblio and abstracts, literature review.

JANTSCH, ERICH Technological Forecasting in Perspective. A framework for technological forecasting, its techniques and organization; a description of activities and an annotated bibliography. OECD.

M.I.T. CENTER FOR POLICY ALTERNATIVES
An Annotated Bibliography with Index for Technology Policy Studies. 2nd edition. May 7, 1975. Pp. 418.

Prepared with use of computer software. Organized by "key-words;" author and title indexes; partially annotated.

MENCHER, ALAN Bibliography for the Study of U.K. Science and Technology Policy with Special Reference to Economic and Industrial Development. Part 1, 1959-1973. M.I.T. Centre for Policy Alternatives and London Graduate School of Business Studies. M.I.T. Bibliography no. 1091, 1973. Pp. 92.

PEITCHINIS, STEPHEN G. Effects of Technological Changes on Employment and Educational and Skill Requirements. An Annotated Bibliography. Department of Economics, University of Calgary, January 1978. Pp. 63.

RIDER, K.J. History of Science and Technology. A Select Bibliography for Students. 2nd edition. London, the Library Association. 1970. Pp. 75. 353 entries. Index. Annotated.

Science and technology treated separately. Half devoted to science, half to technology. Included are bibliography, periodicals, general histories, histories by period and subject.

TECHNOLOGY AND CULTURE "Current bibliography in the history of technology," 1962, Winter 1964, Spring 1965, 1966, April issues 1967-77.

Detailed classifications: 6 chronological divisions, and within each, classification into such groups as general works, sources, economic and social history, and into various branches of technology (materials and processes, industrial organization etc.) Some annotations; books and articles.

UNITED STATES NATIONAL SCIENCE FOUNDATION, OFFICE OF SPECIAL STUDIES

Bibliography on the Economic and Social Implications of Scientific Research and Development. Washington, 1959. Pp. 53.

Annotated biblio. 235 books, mostly published after 1949.

-----A Selected Bibliography of Research and Development and its Impact on the Economy. Washington, 1958. Pp. 28.